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ABSTRACT

From 1993 to 1995, the National Science Foundation (NSF) support for two-year colleges increased from about $7.6 million to $35.1 million. This report describes NSF activities in support of two-year college science, mathematics, engineering, and technology education for fiscal year (FY) 1995. Following an introduction and overview, including tables showing the levels of two-year college support by NSF division for 1993 to 1995, the first section provides information on leadership and outreach activities undertaken by the Education and Human Resources (EHR) division, including workshops related to environmental technician education and ethics and biotechnology, a community college day and President's meeting at the NSF, preparation of a guide to coalition building, a survey of two-year college technical education, and related conferences and publications. The second section describes leveraged program support by divisions of EHR, including the Division of Undergraduate Education's support for advanced technological education (ATE), instrumentation and laboratory improvement, undergraduate faculty enhancement, and curriculum development; the Elementary, Secondary, and Informal Education Division's support of ATE, teacher development, and young scholars; and the Human Resource Development Division's support for the Alliances for Minority Participation and other projects. The final section reviews leveraged program support by the Research Directorates, focusing on the NSFNET and Network Infrastructure Program and a technology reinvestment program. Appendixes include recommendations from the Presidents' meeting, a list of two-year college awards by state for 1994-95, and a map of 1994-95 award recipients. Contains 12 detailed tables. (TGI)

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NATIONAL SCIENCE FOUNDATION

ACTIVITIES IN SUPPORT OF TWO-YEAR COLLEGE SCIENCE, MATHEMATICS, ENGINEERING, AND TECHNOLOGY EDUCATION

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIVISION OF UNDERGRADUATE EDUCATION

JC 960 391

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DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
Division of Undergraduate Education

To Neal F. Lane
Director, National Science Foundation

Luther S. Williams
Assistant Director, Education and Human Resources

From Robert F. Watson
Division Director, Undergraduate Education
NSF's Official Liaison with Community Colleges

Date February 16, 1996

Subject Report: ***Activities in Support of Two-Year College Science, Mathematics, Engineering, and Technology Education: Fiscal Year 1995 Highlights***

This transmits the National Science Foundation (NSF) Report, ***Activities in Support of Two-Year College Science, Mathematics, Engineering, and Technology Education: Fiscal Year 1995 Highlights.***

I forward this report to you in my capacity as NSF's "Official Liaison with Community Colleges" as called for in the Scientific and Advanced Technology Act (PL#102-476). The Division of Undergraduate Education (DUE) is the focal point for NSF's mission in undergraduate education and as such the focal point for community colleges. Work on this report was led by Elizabeth Teles, Lead Program Director for the Advanced Technological Education (ATE) program. Valuable input was provided by Duncan McBride, DUE Section Head for Laboratory and Technology; Ashok Agrawal and Peggie Weeks, Program Directors for ATE and Engineering; Bettye Lawrence, Program Consultant for ATE; Tim Kashmer, Program Assistant for ATE; Kelly DuBose, Program Assistant for Undergraduate Faculty Enhancement (UFE), and Lori-Anne Mooney, Science Assistant for ATE.

Both two-year colleges and NSF can take pride in the quality of activities demonstrated in the projects described in this report. NSF is now making a significant contribution to strengthening science education in the nation's two-year colleges, and I believe is serving well this important national function. As shown by the tables, over the FY1993-1995 period, NSF support for two-year colleges has risen from about $7 million per year to the current level of about $35 million. Although $22 million of this increase can be attributed to the ATE program which is directed primarily at improving technical education in two-year colleges, support through other programs in the Education and Human Resources Directorate (EHR) also continues to rise. Two-year colleges are also engaged with other institutions in collaborative activities in major ways. The national leadership among two-year colleges has played an active and effective role in this progress. In particular, the American Association of Community Colleges (AACC) has been critical to this advancement.

I would be pleased to provide any additional information which you might wish.

Activities in Support of Two-Year College Science, Mathematics, Engineering, and Technology Education

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ACTIVITIES IN SUPPORT OF TWO-YEAR COLLEGE SCIENCE, MATHEMATICS, ENGINEERING, AND TECHNOLOGY EDUCATION

INTRODUCTION AND OVERVIEW

There are currently about 1470 two-year or community colleges in the United States. While the community college movement is almost 100 years old beginning with the opening of Joliet Junior College in Illinois in 1901, few two-year colleges existed until after World War II and most have opened in the past 35 years. Between 1960 and 1975, community colleges increased two and a half times in number, opening at a rate of almost one per week. As one indication of the tremendous growth of two-year colleges, from 1969 to 1992 enrollment in two-year colleges tripled to over 5.7 million students in credit classes, accounting for 44% of the nation's undergraduates and 49% of first time freshmen. About 27% of students in community colleges are underrepresented minorities, and women comprise 58% of community college enrollment **

Two-year colleges support a great diversity of learning objectives including: (a) courses of study that articulate with and transfer to four-year colleges and universities, (b) technical education and other career-oriented programs, (c) developmental education for students underprepared to begin college work, and (d) additional coursework for students who have baccalaureate and other advanced degrees but desire to change careers or seek professional advancement. Increasingly, teachers in the K-12 system and those who earn Ph.Ds in science fields originate their higher education in these colleges.

The National Science Foundation (NSF) recognizes the critical role that two-year colleges play in science, mathematics, engineering, and technology education. NSF is now demonstrating a strong interest in improving and strengthening science, mathematics, engineering, and technology programs by providing educational support to two-year colleges through leadership activities and leveraged program support. Among NSF activities are: (a) grants made directly to two-year colleges, (b) collaborative efforts in which two-year colleges play a major role, (c) support of curriculum materials and teacher activities that benefit students and faculty in two-year colleges as well as others in the academic community, and (d) workshops, conferences, studies, and other special activities.

** Data from ***National Profile of Community Colleges: Trends and Statistics 1995 - 1996*** published by the American Association of Community Colleges (AACC)

Increased interest at NSF in two-year colleges resulted in an almost five-fold increase in direct support to two-year colleges from 1993 to 1995. Support grew from about $7.6 million in FY 93 to $23.4 million in FY 94 to $35.1 million in FY 95. A major component of NSF's plan for support of two-year colleges is the Advanced Technological Education (ATE) program, a program created in 1994 aimed primarily at two-year colleges and their academic and industrial partners. While the ATE program accounts for approximately $22 million or 63% of NSF support, support continues to grow in other programs in the Directorate for Education and Human Resources (EHR). Support has remained stable at about $1 to $2 million per year in the research directorates and has been principally by the Directorate for Computer and Information Science and Engineering (CISE) through the NSFNET and Network Infrastructure Programs.

This document contains information primarily about activities for two-year colleges through the Education and Human Resources Directorate; however, some information on Foundation-wide activities is given to set the report in a broader NSF context. The 192 NSF awards were made to two-year colleges in 37 states and the District of Columbia.

During FY 95, five program directors whose academic backgrounds and experiences were at two-year colleges and who are recognized leaders within the two-year college community worked at the National Science Foundation. Four were in EHR - three in the Division of Undergraduate Education (DUE); and one in the Division of Educational System Reform (ESR). A fifth worked as a part time program director in the Division of Human Resource Management in the Office of Information and Research Management. In addition, a program consultant on contract from a two-year college worked full time on-site with DUE, primarily on the Advanced Technological Education (ATE) program. One of these program directors in DUE is a permanent NSF employee, the first permanent NSF program director with a background in two-year college education.

The Division of Undergraduate Education (DUE) is the focal point of NSF activities in support of science, mathematics, engineering, and technology education in two-year colleges. The Division Director of DUE serves as NSF's "Official Liaison with Community Colleges" as called for in the Scientific and Advanced Technology Act (PL#102-476). Because two-year colleges are part of higher education, DUE continues to provide the predominant support for two-year colleges. In 1995, DUE accounted for $19.1 million or 54% of the direct support to two-year colleges as well as much of the collaborative support through all DUE programs.

Table 1

FOUNDATION-WIDE AWARDS TO TWO-YEAR COLLEGES

1993 - 1995

Directorate	1993 # Awards	1993 Dollars (in $1000s)	1994 # Awards	1994 Dollars (in $1000s)	1995 # Awards	1995 Dollars (in $1000s)
Office of Director	4	$58	0	$0	0	$0
Planning and Evaluation	0	0	1	59	1	5
Mathematical and Physical Sciences	1	66	4	346	2	185
Social, Behavioral, and Economic Sciences	2	132	1	80	0	0
Computer and Information Science and Engineering	11	295	29	951	19	836
Geosciences	0	0	0	0	0	0
Engineering	2	272	1	83	0	0
Biological Sciences	2	647	6	522	1	56
Total for Research Directorates	22	1,470	42	2,041	23	1,082
Education and Human Resources	101	6,107	167	21,413	169	33,999
TOTAL	**123**	**$7,577**	**209**	**$23,454**	**192**	**$35,081**

These figures only include those awards where 1 of the principal investigators is at a 2-year college. Data is not included on awards in which 2-year colleges are part of consortia, but principal investigators are not from 2-year colleges. There is significant support to 2-year colleges through consortia activities. See Table 2 for EHR details.

Dollars reported in the table for FY94 and FY95 are only FY94 and FY95 dollars respectively. Total EHR commitment for these projects including out-year funding totals $39 M in FY94 and $73 M in FY95. Commitments by NSF, including out-year funding for these awards, total $44M in FY94 and $74M in FY95.

Figure 1

Foundation Awards to Two-Year Colleges 1993-1995

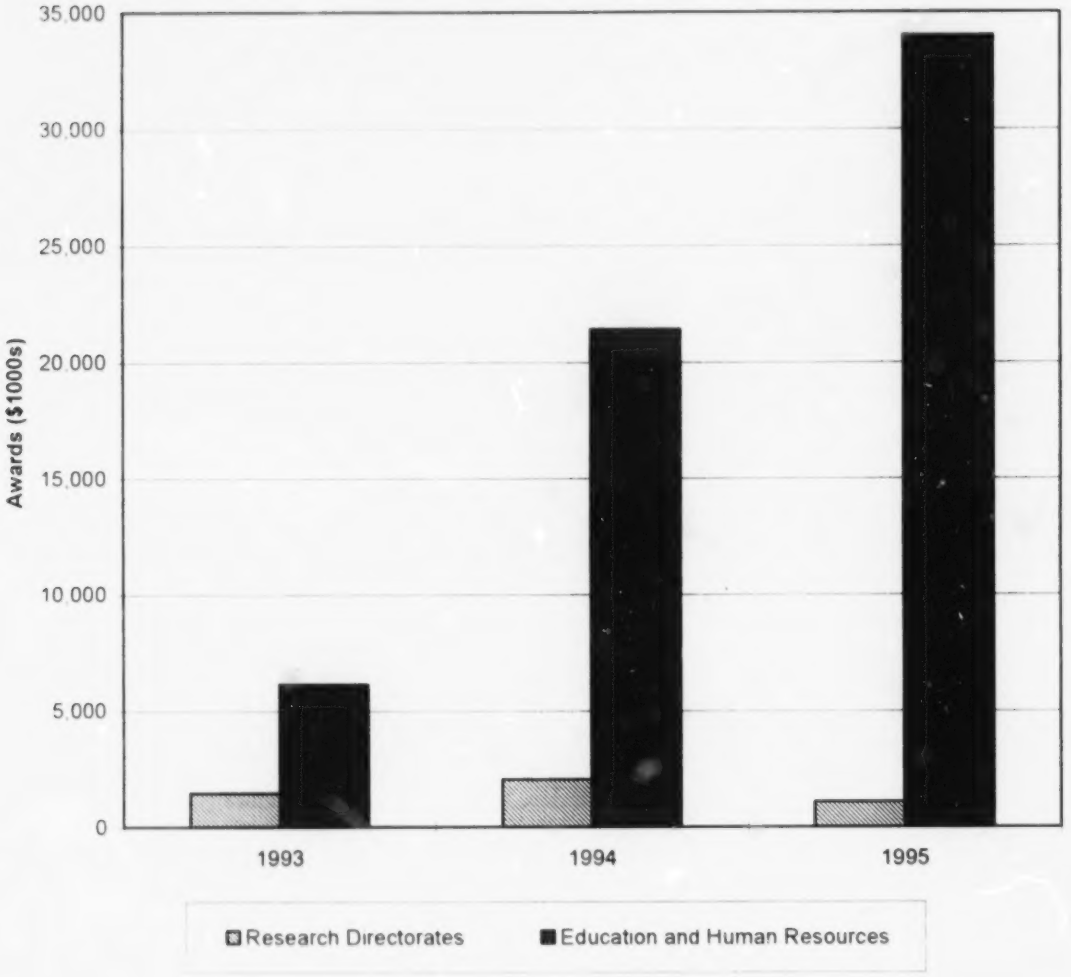


Table 2

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES AWARDS TO TWO-YEAR COLLEGES

1993 - 1995

Division	1993 # Awards	1993 Dollars (in $1000s)	1994 # Awards	1994 Dollars (in $1000s)	1995 # Awards	1995 Dollars (in $1000s)
Undergraduate Education (DUE)	93	$5,603	126	$14,716	126	$19,157
Elementary, Secondary, and Informal Education (ESIE)	6	330	33	5,967	33	8,875
Human Resource Development (HRD)	2	174	4	462	6	2,268
Graduate Education and Research Development (GERD)	0	0	1	4	0	0
Division of Educational System Reform	0	0	1	140	1	1,600
Research, Evaluation, and Communication (REC)	0	0	2	124	3	2,099
TOTAL	**101**	**$6,107**	**167**	**$21,413**	**169**	**$33,999**

The funds in the ATE program were divided 2/3rds to DUE and 1/3rd to ESIE. To avoid duplication of numbers, 2/3rds of the 63 awards (39 in FY94 and 42 in FY95) have been assigned to DUE and 1/3rd (19 in FY94 and 21 in FY95) have been assigned to ESIE. The total dollars have also been split in ratio of 2:1.

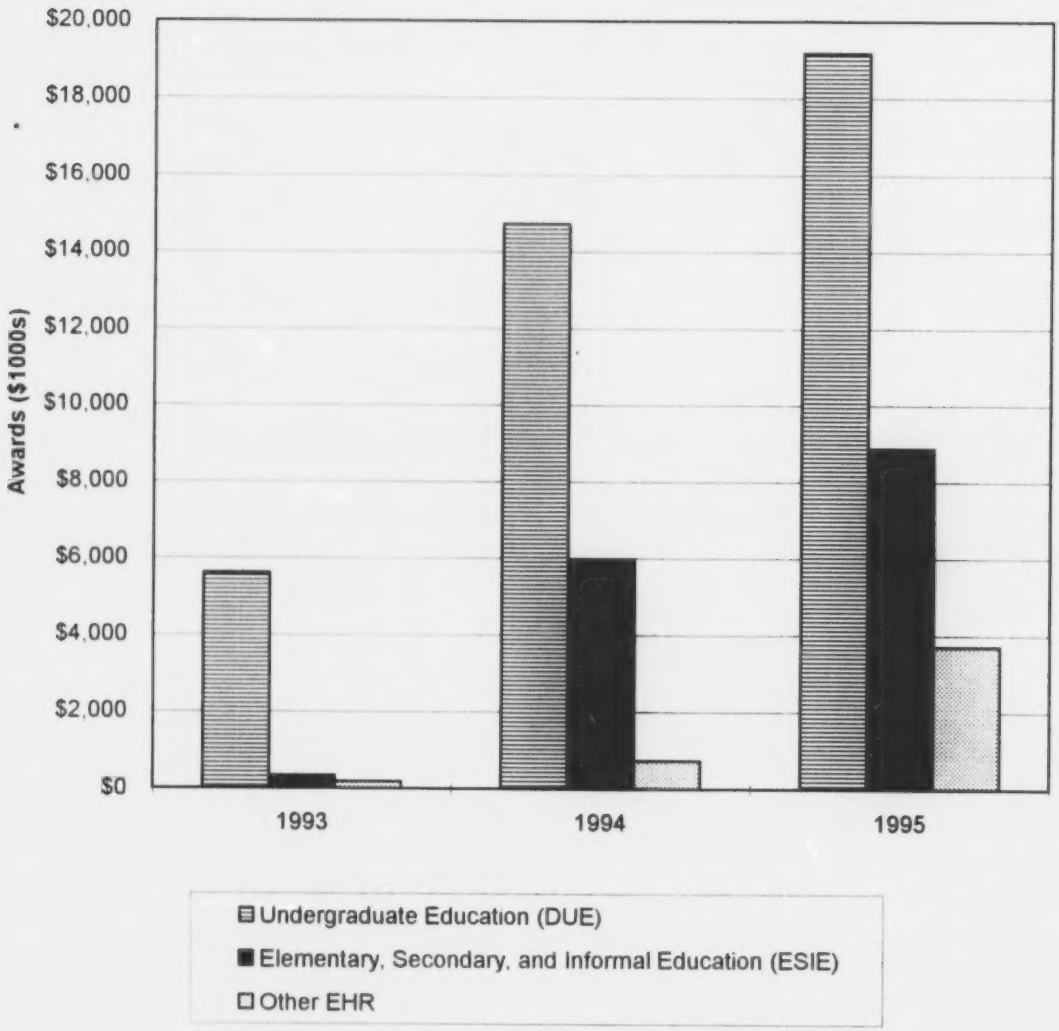
These figures only include those awards where 1 of the principal investigators is at a 2-year college. Data is not included on awards in which 2-year colleges are part of consortia, but principal investigators are not from 2-year colleges. There is significant support to 2-year colleges through consortia activities. All ATE awards (except those funds which were used to co-fund projects submitted to other programs) are included because all ATE awards had either a principal investigator or co-principal investigator from a two-year college or included a 2-year college on a subcontract or involved two-year colleges as prime players. In some cases in the ATE program, the grant was made to a system or university on behalf of a consortium.

Dollars reported in the table for FY94 and FY95 are only FY94 and FY95 dollars respectively. Total EHR commitment for these projects including out-year funding totals $39 M in FY94 and $73 M in FY95.

REC was formerly Research, Evaluation, and Dissemination (RED).

Figure 2

EHR Awards to Two-Year Colleges 1993-1995



LEADERSHIP ACTIVITIES: EDUCATION AND HUMAN RESOURCES

Outreach Workshops

In 1995, DUE and ESIE sponsored a series of regional workshops which were attended by numerous administrators and faculty members, for the most part from two-year colleges, but also from four-year institutions and secondary schools. Such workshops were held in Wisconsin, Maryland, Alabama, Mississippi, Illinois, Virginia, Oklahoma, Texas, California, Colorado, and Missouri. The goals of the workshops were to (a) discuss with the two-year community and their academic and industrial partners the newly initiated Advanced Technological Education (ATE) program, (b) encourage quality proposals from two-year colleges to more NSF programs, (c) provide information on other NSF programs of interest to two-year colleges, and (d) give the two-year college community an opportunity to interact with NSF program directors.

The following were among the workshops held:

International Technology Education Association (ITEA)	Kansas City, Kansas
American Association of Community Colleges (AACC)	Minneapolis, Minnesota
American Society for Engineering Education (ASEE)	Anaheim, California
Two-Year Colleges in Mid-Atlantic Region - South	Catonsville, Maryland
American Mathematical Association of 2-Year Colleges	Tulsa, Oklahoma
League for Innovation in the Community College	Houston, Texas
National Council for Resource Development (NCRD)	Arlington, Virginia
American Indian Higher Education Consortium (AIHEC) NSF Technical Assistance Meeting	Denver, Colorado
Midwest Regional NSF Conference	St. Louis, Missouri

In addition, NSF Program Directors gave numerous presentations at professional meetings involving two-year colleges. Those listed below with an asterisk involved primarily two-year college faculty and administrators while others involved significant numbers of two-year college faculty. These include but are not limited to: the American Mathematical Association of Two-Year Colleges (AMATYC) *, the National Association of Biology Teachers (NABT), the American Chemical Society (ACS), the American Association of Physics Teachers (AAPT), the Mathematical Association of America (MAA), the Pennsylvania State University System Technology Educator's Conference *, the National Council for Resource Development National Convention (NCRD) *, Quality Education for Minorities (QEM), Regional Technology Strategies *, National Coalition for the Advancement of Manufacturing (NACFAM), the League for Innovation in the Community College *, Mathematical Sciences Education Board (MSEB) Workshop on Mathematics for the Technical Workforce, American Association of Community Colleges (AACC) *, American Society for Engineering Education (ASEE), Accreditation Board for Engineering and Technology (ABET), American Society for Microbiology (ASM), Biology Institute Workshop, International Technology Education Association (ITEA), American Vocational Association (AVA), Frontiers in Education (FIE), and College-Industry Education Conference (CIEC).

1994 Awards and Activities: Advanced Technological Education

In February of 1995 the book ***Advanced Technological Education: 1994 Awards and Activities*** *(NSF 95-6)* was published. This publication includes information about the ATE program and FY 1994 awards, a brief history of the ATE program, a listing of awards by types of technology, abstracts of all awarded projects, an index of awards by state, an index of principal investigators, and numerous maps.

Critical Issues in Environmental Technician Education Workshop

In February of 1995 an NSF supported ***Workshop on Critical Issues in Environmental Technician Education*** was held in cooperation with the Advanced Technological Environmental Education Center (ATEEC). The 43 participants from across the country represented business and industry, two-year colleges, four-year colleges and universities, secondary schools, professional societies, and federal agencies with an interest in the education of environmental technicians. The following 5 critical issues were examined by the groups: (a) professionalization of environmental technician education as well as preparation, credentials, professional advancement, and continuing education of faculty; (b) curriculum and program development and implementation in environmental technician education; (c) environmental equity and human resources; (d) current and future employment needs; and (e) transferability of credits (2 + 2 + 2). The publication from the workshop ***Partnering to Build a Quality Workforce: Critical Issues in Environmental Technology Education in Two-Year Colleges*** can be obtained from ATEEC, 500 Belmont Road, Bettendorf, Iowa 52722 or by phone at 319-344-0354.

Engineering Technology Education in Two-Year Colleges: National Agenda Workshop for the Future of Engineering Technician Education

NSF's Advanced Technological Education (ATE) Program funded a workshop to design a ***National Agenda for the Future of Engineering Technician Education***. This workshop, held October 1995, was hosted by Sinclair Community College in Ohio under a grant from the ATE program at DUE. The workshop was co-sponsored by the Engineering Technology Division of ASEE and the Technology Accreditation Commission of ABET. Fifty-six participants from 25 states represented academic institutions, professional societies, and business and industry.

The purpose of the workshop was to identify the scope of changes that should occur beyond the turn of the century in the area of engineering technician education, primarily in two-year colleges. Seven topics served as the basis for discussion: (a) Assessment and Evaluation, (b) Education / Career Continuum, (c) Educational Environment, (d) Faculty Issues, (e) Professionalization and Accreditation, (f) Student Issues, and (g) Technical Employment.

The final report of the workshop will be published in 1996.

Ethics and Biotechnology: A Blueprint for the Future

In January of 1996 an NSF supported workshop on ***Ethics and Biotechnology*** was hosted by the Biotechnology Center at Northwestern University. The purpose of this workshop was to provide a blueprint for the incorporation of ethics in the teaching, practice, and management of biotechnology. A seamless strategy was used in which leaders from K-12, community colleges, four year colleges, research universities, industry, and professional societies worked together to develop a plan for the future. The goal was to assure that the United States maintains the highest standards of ethics in biotechnology education, both now and in the future. Principal Investigators or representatives from biotechnology programs funded by the ATE program were among the participants. An important aspect of the workshop was that it afforded an opportunity for leaders from a variety of different arenas to meet and address concerns that are important in a seamless implementation of ethics in science and biotechnology, primarily in two-year college biotechnology programs.

The proceedings of the workshop will be published in 1996.

Community College Day at NSF

NSF recognized Community College Month by having a special Community College Day at the Foundation. The primary event was a seminar on the role of community colleges in U.S. education and a follow-up round table discussion. The meeting took place in April 1995 and featured a presentation by Gwendolyn Stephenson, Chancellor of St. Louis Community College System. All NSF staff were invited to attend, and special invitations were issued to community college faculty and administrators from the capital area. Stephenson and other participants urged NSF to expand its current community college activities to meet the needs of this large population of constituents. Networking and collaboration between two- and four-year schools were cited as issues, as was the need for facilities and equipment upgrade at the community colleges. It was pointed out that, more than any other educational sector, community colleges play a critical role in the crucial areas where the student and the workforce intersect.

Community College Presidents' Meeting at NSF

On Monday June 12, 1995 the Directorate for Education and Human Resources (EHR) hosted a meeting, in cooperation with the American Association of Community Colleges (AACC), of 12 community college presidents. These presidents were invited because they were recognized as national leaders with a strong interest in science, mathematics, science, engineering, and technology education. The purpose of the meeting was to inform these presidents about present NSF initiatives and to solicit their input on future directions, needs, and initiatives. Among the items discussed were (a) federal support of science and technology in community colleges, (b) the educated workforce, (c) teacher education in community colleges, (d) NSF Leadership activities, (e) federal support to leverage other funds, (f) NSF Advanced Technological Education (ATE) program, and (g) other NSF programs. Other issues of common interest were also discussed. In particular, NSF is looking for two-year college leadership in three strategic areas: (a) assuring that all students achieve fundamental scientific and technical literacy, (b) preparing technical workers for the high performance workplace, and (c) developing a comprehensive collaboration between K-12 and community colleges in the preparation of future K-12 teachers and others SMET graduates.

A summary of the action items recommended by the Presidents is included in Appendix I. These recommendations are currently under review at NSF.

International Technician Education

In July of 1995, a meeting was held at NSF to plan a 1996 conference on International Technician Education. The primary goal of the conference will be to facilitate the development of a world-class technician education program and delivery models for preparation of the global technical workforce of the 21st Century. To help prepare for the conference, representatives from NSF and others visited Hannover, Germany under the sponsorship of the Accreditation Board for Engineering and Technology (ABET) and the German Marshall Fund. The purpose of the tour was to study the German technical education and training system, including the *Dual System of Technical Education and Apprenticeship Program* in the Federal Republic of Germany. The international conference is planned for 1996 or 1997.

Participants suggested that such a conference should be used to (a) provide an international forum for exchange of new ideas, trends, and latest information on technician education; (b) identify innovative and promising models of technician education delivery systems, curricula, teaching, and assessment practices; (c) develop a comprehensive document that identifies the key characteristics, strengths, and weaknesses of technician education programs in the U.S. and other selected countries; (d) create a framework for innovative and world-class technician education programs; and (e) develop an action plan for international collaborations for technician education.

TRP/MET Grantees PI Conference

In July of 1995 two Program Directors from DUE and several ATE grantees were invited to participate in the Technology Reinvestment Program/Manufacturing Education and Training (TRP/MET) Grantees Conference held in San Diego. The basic theme of the meeting was "meet, share, learn, collaborate, and disseminate." Two-year college partners are very critical components in the Manufacturing Education awards. Workshops at the meeting included: (a) overcoming barriers to the not-invented-here syndrome and institutionalization, (b) linking evaluation and assessment to continuous improvement, (c) establishing multi-institutional partnerships, partnerships with other types of educational institutions, and partnerships within educational institution, and (d) industrial perspectives.

NSF Study of Undergraduate Education

During 1995 and 1996, the Education and Human Resources (EHR) Directorate of NSF has undertaken a general review of the condition, needs, and opportunities of undergraduate education in the United States in the disciplinary areas of science, mathematics, engineering and technology (SMET). It is expected that this review will clarify the potential contributions of various methods of strengthening undergraduate education, with the objectives of (a) producing K-12 teachers who are both scientifically and pedagogically well-prepared, and (b) educating undergraduate students in associate and baccalaureate programs who are generally empowered to be full participants in a scientific and technological society and specifically ready to work and lead in the high performance workplace of advanced technologies. There is particular interest in finding innovative practices in undergraduate education, the unmet needs of those who receive basic undergraduate instruction in SMET disciplines, infrastructure needs for best instructional practice, and institution-wide problems and issues that need addressing before major changes can occur to raise the quality of the undergraduate's learning.

During the period, NSF has sought the assistance of a selected number of influential leaders in two-year colleges to participate in preparing a statement to be included in this comprehensive review of undergraduate education in SMET. In addition, special sessions were held at the

American Association of Community Colleges (AACC) and the American Mathematical Association of Two-Year Colleges (AMATYC) annual conventions to solicit input.

Coalition Building for Effective Faculty Enhancement

In October of 1993 the Division of Undergraduate Education sponsored a workshop on ***Coalition Building for Effective Faculty Enhancement***. Participants included principal investigators from two- and four-year coalitions supported under the Undergraduate Faculty Enhancement, Course and Curriculum, and Calculus projects plus selected other individuals who had expertise relative to coalitions. The goals of the workshop were to:

- develop a guidebook that could be used by individuals who are planning and leading coalitions,
- identify needs of community college faculty relative to faculty enhancement,
- generate increased interest from the scientific community in forming cooperative and collaborative projects,
- increase interest in interdisciplinary projects, and
- discuss evaluation and dissemination for coalition projects.

The guidebook, published in March of 1995 by Prince George's Community College, is entitled ***Putting the Pieces Together: A Guide Book for Leaders of Coalitions of Two- and Four-Year Colleges and Universities*** and can be obtained by writing to Dr. Patricia Cunniff, Science and Technology Resource Center, Prince George's Community College, 301 Largo Road, Largo, Maryland 20772.

Survey on Technical Education in Two-Year Colleges

From 1993 to 1995, NSF's Division of Science Resource Studies (SRS) in cooperation with the Division of Undergraduate Education (DUE) and the Division of Research, Evaluation, and Communication (REC) conducted a survey on technical education in two-year institutions. This was the first study conducted by NSF on technical education. The report provides data on aspects of engineering and science technology education in the nation's two-year colleges including numbers of two-year colleges involved in science and engineering technology; numbers of certificates and associate degrees awarded; enrollment and faculty in these programs; fields of study; linkages between technology programs and local businesses and industry including co-op, worker training and re-training, and school-to-work; linkages between technology programs and secondary schools including Tech-Prep; and transfer arrangements with four-year institutions. The report ***Technical Education in 2-Year Colleges: HES 17*** can be obtained either through DUE or SRS. The report was published in March of 1995.

Cooperative Efforts with American Association of Community Colleges (AACC)

- **AACC National Convention**

In April of 1995 Luther Williams, NSF Assistant Director for Education and Human Resources, was invited to give one of the plenary addresses at the AACC National Convention. He spoke on the importance of community colleges in science, mathematics, engineering, and technology education. In particular he emphasized their importance in partnerships with other educational institutions including K-12 systems and four-year colleges and universities, the future technological and teaching workforce, and scientific and technical literacy. NSF also had a booth at the meeting, hosted a special session on the undergraduate study, and put together a forum on

the ATE program with several community college Presidents. In addition many two-year college projects supported by NSF gave special forums and sessions.

- ***Community College Times***

In May of 1995 NSF initiated a series of regular contributions to the AACC biweekly newspaper the *AACC Community College Times*. Special columns have appeared by Robert Watson, Division Director of DUE; Margaret Cozzens, Division Director of ESIE; and several program officers.

Advanced Technological Education Principal Investigator's Conferences

In November of 1995 the American Association of Community Colleges (AACC) sponsored the second annual Principal Investigators (PI) Conference workshop on Advanced Technological Education (ATE) in cooperation with NSF. A preconference workshop focused on grant management and audit procedure. The workshop involved more than 150 ATE project principals from 62 of the currently funded ATE projects. They represented two and four-year colleges, universities, secondary schools, industry, and professional organizations interested in technician education.

A primary purpose of the conference was a focus on networking to encourage access to available resources produced by similar projects. Poster sessions, issue discussions, discipline-specific seminars, and presentations were organized to encourage interchange among the participants.

According to the industry plenary speaker, in industry today, the positions and roles of engineers, technologists and technicians are changing rapidly. Technician positions are evolving into what have traditionally been engineering jobs and responsibilities. The workforce of the future must be well prepared to participate and lead in the high performance work place. Thus, the education of technicians requires more mathematics, science, and technology as part of the curriculum.

Conference participants reflected upon the impact that the ATE program initiated by the National Science Foundation has made toward making a difference in educating a highly qualified workforce for the future for the advancement of our Nation. Workshop participants believe that the ATE program is answering many questions raised at the first annual workshop. First, the ATE program recognizes that technicians come from a variety of background preparations. Thus, the ATE program is supporting a variety of types of projects. Second, in the first Leadership Conference participants were concerned with dissemination of project results and workforce skill standards as well as student issues. During this year's conference, discussions centered around how projects are refining skill standards, publishing materials, addressing student recruitment and retention, and developing interdisciplinary projects.

In October of 1994, the ATE Program, in cooperation with AACC, sponsored an ATE Leadership Workshop preceding the first PI's Conference for the ATE program. The Leadership Workshop involved education leaders from two- and four-year colleges, universities, and secondary schools; leaders from industry with interest in technical education; and representatives from professional societies. The first ATE PI meeting involved the 3 newly awarded ATE Centers, the 16 ATE planning grants for Centers, and about 6 of the large curriculum development projects. That PI meeting was designed to help ATE award recipients think of the ATE program more broadly than just their own projects and to consider how the ATE program as a whole can impact and improve technological education in this country.

Activities Focused on Increasing the Participation of Minorities in SMET Education in Two-Year Colleges

In addition to supporting projects which improve the quality of SMET education for all students, programs emphasize groups traditionally underrepresented in those areas. In particular, the ATE program is committed to involving faculty who are underrepresented in SMET fields. Staff make an extra outreach effort to assist members of underrepresented groups as active participants in the advancement and success of the ATE program. Of the 50 ATE projects, Centers, and planning grants newly supported in 1994, 11 (22%) have female principal investigators and 8 (16%) have minority principal investigators. In 1995, of the 40 new projects 9 (23%) have female principal investigators and 2 (5%) have minority principal investigators. Approximately 38% of the reviewers in the program are women and 13% are minorities.

4th Annual Conference on Diversity in the Scientific and Technological Workforce

During the 1995 annual NSF diversity conference, a public forum was held on undergraduate education. One two-year college panelist and many audience participants represented community college interests. Two of the goals discussed were of particular interest to two-year colleges: (a) education of a technologically well-prepared workforce that can both participate and lead in the high performance workplace and (b) the growth in the number of citizens who are empowered to be full participants in a scientific and technologically oriented society.

Other Publications Directly Involving Two-Year Colleges Published Between 1991 and 1995:

Activities in Support of Two-Year College Science, Engineering, Technology, and Mathematics Education: Fiscal Year 1994 Highlights (NSF 95-74). This report gives the highlights of 1994 NSF support to two-year colleges through both leadership activities and leveraged program support. In particular, it highlights the growth in NSF support for two-year college activities from 1992 to 1994. Information on the 209 awards to two-year colleges is provided. Published in 1995.

Gaining the Competitive Edge: Critical Issues in Science and Engineering Technician Education (NSF 94-32). The workshop held July 21 - 23, 1993 in Washington, D. C. was in response to a nationally recognized need for a well-educated technical workforce in the high performance work place of advanced technologies to help the United States maintain a competitive edge in the world market. The purpose of the workshop was to identify critical issues in science and engineering technician education; develop recommendations for industry, academe, and government; and engage these communities into action. Deliberations focused on development of strategies to strengthen two-year college technician education programs; however, improving education programs for prospective technicians at the secondary school level and expanding opportunities for technicians at four-year colleges and universities and after employment were addressed as well. Published in 1994.

Activities in Support of Two-Year College Science, Engineering, Technology, and Mathematics Education: Fiscal Year 1993 Highlights (NSF 94-86). This report gives the

highlights of NSF 1993 support to two-year colleges through both leadership activities and leveraged program support. Abstracts are included for awards made through the Division of Undergraduate Education. Published in 1994.

2nd Annual Conference on Diversity in the Scientific and Technological Workforce (NSF 94-12): This report contains the report on a session organized around the topic of *Transition of Students From Two-Year to Four-Year Colleges*. This session dealt with the successful transition of minority students to four-year institutions. The objectives of the session were to develop strategies for achieving the broader goal of a significant increase by the year 2000 of minority students enrolled in SMET in two-year colleges that successfully transfer to four-year institutions. Published in 1994.

Building the System: Making Science Education Work (NSF 94-107) is a report of the 1994 NSF Invitational Conference. This conference included a session focused on *The New American Work Force: Scientific and Technical Development* and two exhibits which demonstrated innovative new approaches to technician education. Among the issues discussed in the session were education versus training; content base of basic science and mathematics; articulation and collaboration among institutions; avoidance of dead-end tracking; complexity of the diverse student population entering technical fields; and role of "Tech-Prep" in attracting, motivating, and training future technicians. A briefing paper for the conference entitled *Technician Education: The Future of the U. S. Work Force* is included in the proceedings.

Partners in Progress: Report of a National Science Foundation Workshop on the Role of Professional Societies in Two-Year College Science, Technology, Engineering, and Mathematics Education (NSF 93-64) This report contains recommendations from both interdisciplinary and disciplinary working groups for professional societies actions to: (a) support the integrated teacher-scholar role of two-year college SMET faculty, (b) encourage the formation of networks among SMET faculty, (c) promote membership and leadership by two-year college faculty, (d) enhance SMET education in two-year colleges, and (e) increase funding to two-year college SMET faculty. Published in 1993.

National Conference on Diversity in the Scientific and Technological Workforce (NSF 93-22) This report contains a copy of the plenary address made at the conference by Charles Merideth, President of New York Technical Institute, on the role of community and technical colleges in the education of minorities. He calls for these institutions to become leaders in this effort and to abandon the role of being ancillary to traditional four-year institutions.

Matching Actions and Challenges: Report of a National Science Foundation Workshop on Science, Engineering, and Mathematics Education in Two-Year Colleges (NSF 91-111). The focus of this workshop was to reaffirm the important role two-year colleges play in science, mathematics, engineering, and technology (SMET) education. Recommendations are intended for two-year college faculty; professional societies; presidents and administrators; and state, local, and national funding agencies. Published in 1991.

LEVERAGED PROGRAM SUPPORT: EDUCATION AND HUMAN RESOURCES

Division of Undergraduate Education

Faculty members who vigorously combine teaching with scholarship are essential to the creation of vital science, mathematics, engineering, and technology education. The Foundation seeks to provide incentives and rewards to stimulate and motivate faculty members so that creative teaching and instructional scholarship become a part of the "faculty culture" at all institutions. Faculty members who are primarily teachers need opportunities to deepen their knowledge as well as opportunities to work in the creative renewal of undergraduate courses, curricula, and laboratories.

DUE provided direct support to two-year colleges in FY 95 through the following programs:

- **Advanced Technological Education (ATE)** program for the development of courses, curricula, and faculty and teacher preparation and enhancement to improve the quality of education for science and engineering technicians;
- **Instrumentation and Laboratory Improvement (ILI)** program for the development of new or improved laboratory courses or experiments;
- **Course and Curriculum Development (CCD)** for projects to improve the quality of courses and curricula; and
- **Undergraduate Faculty Enhancement (UFE)** to enable faculty members to learn about new techniques and developments in their fields.

The next several sections of this report show DUE/NSF support through those programs.

DUE also provided support through consortia activities involving two-year colleges in such programs as the **Collaboratives for Excellence in Teacher Preparation, Systemic Changes in the Chemistry Curriculum**, and **Mathematical Sciences and Their Applications Throughout the Disciplines.** In addition, several awards were made through **UFE** and **CCD** to four-year institutions which were designed primarily to support two-year college curriculum development or faculty enhancement. For example:

- The **Collaboratives for Excellence in Teacher Preparation** program involves two-year colleges in collaborative activities with four-year colleges and universities. Two-year colleges serve both (a) undergraduate students who are part of the future K-12 teaching workforce and (b) returning students with undergraduate degrees who lack the mathematics and science needed for certification. Two-year colleges are involved in all Collaboratives. For example, two-year colleges play a major role in the Collaborative award to Montana State University. Six two-year tribal colleges are among the twelve participating institutions of higher education in the state. The primary focus of the Montana Collaborative is to increase the number of Native Americans in the nation's teaching workforce who are well-educated in science and mathematics. This Collaborative recognizes that two-year colleges are vital to this effort. In 1994, 14 of the 42 students who received NSF scholarship support in Montana were attending tribal, two-year colleges. The Rocky Mountain, Dominguez Hills, and Arizona State

Collaboratives also involve two-year colleges in substantive ways. In several cases community college faculty are co-principal investigators or are taking other leadership roles in the projects. Faculty from both two-year and four-year institutions are addressing reform in chemistry, mathematics, and diversity initiatives. For example, in the Rocky Mountain Collaborative the Community College of Denver is experimenting with tandem arrangements in chemistry and mathematics courses to enable students to take these courses as a cohort group and organize cooperative study groups.

- Two-year colleges were involved in all of the awards made in the newly initiated **Systemic Changes in the Chemistry Curriculum**. For example CUNY City College and partner community colleges in New York City have a project to redesign and modernize the undergraduate chemistry curriculum which focuses on a new teaching model - *Workshop Chemistry*. The University of Wisconsin-Madison and Madison Area Technical College through the *New Traditions Project* are impacting the chemistry curriculum and technician education by innovations in several areas: student-focused active learning; inquiry-based, open-ended laboratories; interdisciplinary courses; topic oriented curriculum; and information technology/computer tools. The *ChemLinks* project centered at Beloit College is actively involving the Advanced Technology Environmental Education Center (ATEEC) as well as other two-year colleges in a project that is working closely with the *Modular Chemistry Consortium* project that includes the University of California-Berkeley and 17 other two- and four-year colleges and universities. These two groups are developing modules that present chemistry in the context of real-world problems. By involving many two-year colleges, these projects are having an impact on chemistry courses taken by students in transfer programs as well as those in two-year technical programs.

- In the new **Mathematical Sciences and Their Applications Throughout the Curriculum** most projects also involve two-year colleges in major ways. For example, a consortium comprised of the University of Pennsylvania, Villanova University, Polytechnic University, Community College of Philadelphia, two Philadelphia public schools, and the Society for Industrial and Applied Mathematics (SIAM) is undertaking a major initiative to integrate research and real-world applications from various disciplines into the mathematics curriculum, and to achieve more effective integration of advanced mathematics and computing into the curricula of disciplines that use mathematics. This project is designed to promote a climate in which faculty from all disciplines view themselves as being jointly responsible for the scientific, mathematical, and technical education of undergraduates, rather than as clients and servers. Renssalaer Polytechnic Institute (RPI) is partnering with Hudson Valley Community College and several other institutions to help students learn connections that exist between mathematics and its applications to engineering, engineering technology, and science. To make these connections clearer, the project is developing a library of hypertext documents that link mathematical topics with contemporary applications. This library of materials will constitute a basis to support a movement towards a studio or workshop mode of instruction and away from the lecture-dominated mode.

- DUE also supported several universities and colleges to work with two-year college faculty in curriculum development or faculty enhancement. For example, the Biological Sciences Curriculum Study (BSCS) group is conceptualizing, writing, testing, and evaluating a set of innovative curriculum materials. This project entitled ***A New Model for Introductory Biology at Two-Year and Community Colleges*** has 15 partners including biology faculty at 8 community colleges, the American Association of Community Colleges (AACC), the two-year section of the National Association of Biology Teachers (NABT), the American Mathematical Association of Two-Year Colleges (AMATYC), and the college division of Kendall/Hunt. The program is designed to help students understand basic unifying principles of biology, develop fundamental skills of critical thinking and scientific reasoning, and recognize applications of science. As another example, the University of California at Davis has a

project entitled ***Introduction to Molecular Biology and Molecular Diagnostics: Continuing Education for Community College Science Faculty*** to offer workshops for faculty as well as internships and research experiences.

As a special activity, DUE funded Edison Community College to help plan a three day working conference designed to serve as a forum for consensus building on the guiding principles for undergraduate education for the next century. Representatives from business, industry, mathematics, science, engineering, and technology disciplines met to share their expertise and experiences and exchange ideas on curriculum design and delivery.

Table 3

DIVISION OF UNDERGRADUATE EDUCATION
FY 95 GRANTS TO TWO-YEAR COLLEGES BY PROGRAM

Program	Number of Awards	Dollars (in $1000)
ILI	57	$ 2,020
CCD	13	1,467
UFE	11	1,415
ATE	63	13,930
Other	3	325
Totals	**147**	**$ 19,157**

CCD includes awards in Course and Curriculum (12) and Science and Humanities (1).

The dollars reported in ATE are 2/3rds of the total dollars awarded since the funds were divided 2/3rds DUE, 1/3rd ESIE. All 63 of the awards are listed under the number of awards since both DUE and ESIE contributed to all awards, however, in Table 2 2/3rds (42 awards) are reported from DUE to avoid double counting.

The dollars reported are only FY 95 dollars. Total commitment for these awards including out-year funding totals $ 31 million.

Table 4

DIVISION OF UNDERGRADUATE EDUCATION
NUMBER OF GRANTS TO TWO-YEAR COLLEGES
BY PROGRAM FY90 - FY 95

Program	1990	1991	1992	1993	1994	1995
ILI	48	54	53	63	60 ω	57
CCD	1	8	12	17	14	13
UFE	1	2	8	13	13	11
ATE	-	-	-	-	56 ω	63
Other	0	0	0	0	2	3
Totals	**50**	**64**	**73**	**93**	**142 ω**	**147**

CCD includes awards in Course and Curriculum, Science and Humanities, Calculus, Chemistry Initiative, and Mathematics Initiative.
ω ATE and ILI co-funded 3 projects in 1994. The total awards are reduced by 3 to avoid double counting.

Advanced Technological Education

Both Congress and the White House have emphasized the importance of the technical workforce to a global competitive economy. The *Scientific and Advanced Technology Act of 1992* called for the National Science Foundation to establish a national program to improve the education for technicians in advanced technology fields utilizing the resources of the nation's two-year colleges. In August 1993, NSF announced the ***Advanced Technological Education*** **(ATE)** program. These efforts have created a sound foundation for cultivating innovative programs to advance technological education in the United States. The purpose of the new ATE program is to promote exemplary improvement in advanced technological education at the national and regional level through support of curriculum development and program improvement for technicians being educated for the high performance workplace of advanced technologies. The focus of the ATE program is development of strategies to strengthen two-year college technician education as well as improving the education of prospective technicians at the secondary school level. Expanding opportunities for technicians at four-year colleges and universities and after employment are also addressed. Those projects and Centers supported through the ATE program will result in major improvements in advanced technological education, build collaborations among academic institutions and between academe and industry, serve as models for other institutions, assure that students acquire strong backgrounds in mathematics and science, and yield nationally-usable educational products. **A full report on the FY 95 ATE program can be found in the NSF publication *Advanced Technological Education: 1995 Awards and Activities.*** Consult this document for a more comprehensive description of the program including abstracts of awards.

The ATE program is managed jointly by the Division of Undergraduate Education (DUE) and the Division of Elementary, Secondary, and Informal Education (ESIE).

In FY 95, the ATE program supported projects in curriculum and laboratory development, teacher preparation, and faculty and teacher enhancement and a few Centers of Excellence. The projects represent collaboration of two-year colleges with secondary schools and four-year institutions. Intellectual partnerships with business, industry, and government are featured. All projects demonstrate a leadership role in technician education which includes plans for curriculum, faculty, and teacher development. They serve as clearinghouses and service Centers for reform in the education of science and engineering technicians.

Table 5
FY 95 ATE PRELIMINARY AND FORMAL PROPOSALS

Type of Proposal	**Number Received**
Preliminary Proposals for Centers of Excellence	21
Preliminary Proposals for Projects	65
Total Preliminary Proposals Received	**86**
Formal Proposals for Centers of Excellence	18
Formal Proposals for Projects	97
Total Number Formal Proposals Received	**115**
Total Dollars Requested in Formal Proposals:	**$165 Million**

Table 6
AWARD STATISTICS FOR ATE PROGRAM FOR FY 95
(DOLLARS IN MILLIONS)

Type	**Number**	**FY 95**	**FY96**	**FY97**	**Total**
Centers New	3	$3.0	$2.9	$2.9	$8.8
Projects New	36	9.8	2.5	1.8	14.1
Centers Cont.	3	2.6	2.6	-	5.2
Project Cont.	12	4.4	3.1	-	7.5
Special	9	1.0	.4	.4	1.8
Other Programs	17	1.0	.4	.4	1.9
Leadership Actv.		1.2			1.2
Totals	80	$23.0	$11.9	$5.5	$40.5

Total ATE funds were divided between DUE and ESIE in the ratio of 2:1. Thus for FY 95, about $15.5 million of the $23 million in the ATE program was in DUE and approximately $7.5 million was in ESIE.

As seen in Table 6, ATE partially or fully supported 17 projects submitted to other programs that directly benefited technician education. These included 3 Course and Curriculum Development projects, 2 Undergraduate Faculty Enhancement projects, 4 Chemistry Initiative projects, 2 Instrumentation and Laboratory Improvement projects, 3 Mathematics and Their Applications Across the Disciplines projects, 1 Instructional Materials Development project, and 1 Young Scholars Project.

For the FY 94 deadline for preliminary proposals, the ATE program received 76 preliminary proposal for Centers and 214 preliminary proposals for projects requesting a total of $450 million dollars. In FY 94 the ATE Program received 202 formal proposals including 68 proposals for planning grants for Centers, 16 proposals for Centers, and 118 proposals for projects. ATE partially or fully supported 7 projects submitted to other programs that directly benefited technician education. In the first year of the program, the funding rate was 24.3%. These awards went to institutions in 26 states, the District of Columbia, and Puerto Rico.

In the second year of the program, 39 of the 115 proposals submitted were funded, for a funding rate of 34%. These new awards went to institutions in 25 states plus the District of Columbia. With those ATE projects continuing in FY 95, those co-funded with other projects, and the new awards, ATE projects are currently being supported in 31 states plus the District of Columbia.

The awards cover a wide range of advanced technological fields including biotechnology, environmental technology, computer technology, chemical technology, manufacturing technology, electronics, biomedical engineering technology, geographic information systems technology, instrumentation and calibration technologies as well as the mathematics, physics, chemistry, biology, and other core courses which serve to undergird such programs.

Table 7
ATE AWARD DISTRIBUTION BY FOCUS AREA IN 1995

	Cont.	New
Science Technologies including Biotechnology, Chemical Technology, Computer Technology, and Environmental Technology	13	13
Engineering Technologies including Manufacturing, Electronics, Aerospace Technology, GIS, Civil Engineering Technology	10	23
Core Courses including Mathematics, Physics, Technology Education, Multi-/Interdisciplinary	8	4
Total Awards Among Projects that came into the ATE program	**31**	**40**

Note: The table does not include special ATE projects or those projects submitted to other programs to which ATE contributed funds.

In FY 95, the ATE program supported three new Centers of Excellence in Advanced Technological Education. These are:

- The New Jersey Center for Advanced Technological Education led by Middlesex County College is creating a new associate's degree program in engineering technology to meet the demand for multifunctional engineering technicians. This new program being developed by six community colleges is derived from combining mechanical, computer, telecommunications, and electronics technical programs. It begins in grade 11, continues through the associate degree, and articulates with baccalaureate programs at New Jersey Institute of Technology for engineering technology programs and with Trenton State's program in technology education to prepare secondary teachers of tomorrow.

- The Northwest Center for Sustainable Resources led by Chemeketa Community College in Oregon is a collaborative effort of secondary schools, community colleges, four-year institutions, industries, government agencies, Native American tribes, and applied international research groups. Associate degree natural resource technology programs are incorporating higher levels of mathematics and science using an ecosystems approach that emphasizes sustainable methods of resource utilization. Program graduates enter employment as advanced technicians in a variety of science-based occupations including forestry, fishery, environmental restoration, and geographic surveying or continue for baccalaureate and other advanced degrees.

- Bellevue Community College in Washington, in collaboration with industry, government, secondary schools, other community colleges, and four-year institutions, is leading a new Center in Information Technology to respond to industry's need for well-trained technicians. The Center, with strong input from industry, is developing articulation standards and model associate degree programs particularly for information science. Microsoft and Boeing as well as many small to medium size companies in the Seattle area are active partners in the Center, serving to provide both personnel as well as financial resources.

The three new Centers join the 3 continuing Centers funded originally in FY 94. They are:

- The Advanced Manufacturing Center housed on the campus of Sinclair Community College is a joint effort of Sinclair Community College, the University of Dayton, numerous local industries, and secondary schools. The Center involves community colleges in three other states in the development stage with significant other involvement planned in beta testing stages. The Center is acting as catalyst to improve science, mathematics, and advanced manufacturing instruction by developing an advanced manufacturing curriculum beginning in grade 11, going through the associate degree program, and culminating in a bachelor's degree; writing, pilot testing, and publishing curriculum materials; and disseminating the curriculum, instructional materials, and model program nationally.

- The Environmental Center which is a joint effort of Eastern Iowa Community College, Kirkwood Community College, Hazardous Materials Training and Research Institute (HMTRI), and Partners for Environmental Education (PETE) involves over 500 community colleges in their dissemination efforts. The Center is developing nationally validated curriculum models and instructional materials; establishing comprehensive programs of professional development; serving as a clearinghouse for environmental education information; and acting as a hub for the networking of environmental educators, business and industry, federal agencies, and professional societies.

- The distance education consortium led by Texas State Technical College in Sweetwater involves many institutions in Texas, New Mexico, and Oklahoma. The project is developing the infrastructure and pedagogy to deliver technical courses through distance learning. These

include existing courses in CAD/CAM/CIM as well as new AAS programs in polymer technology and electro-mechanical technology to complement needs of local industry

In addition to the 3 new Centers, in FY 95, the ATE program supported 36 projects. For example

- Seminole Community College in Florida is developing a new and innovative curricula for introductory college physics. The course targets students in technology courses while maintaining the rigor that makes it transferable to four-year colleges and universities. It emphasizes a hands-on approach and motivates students to see connections between physics and their chosen fields.

- Wentworth Institute of Technology in Massachusetts is creating through joint efforts of mathematics and technical faculty, laboratory investigations using engineering laboratories and multimedia simulations that illustrate and teach mathematical concepts.

- Prince George's Community College in Maryland is leading a consortium of 12 community colleges each linked to a NASA Center to conduct faculty enhancement workshops in remote sensing, image processing, and geographic information systems. They are also developing an earth systems science course and interdisciplinary modules which can be infused into science and technology courses.

- Johns Hopkins University is leading a consortium which represents 5 different consortia of community colleges (including over 130 community colleges directly) to develop instructional modules in science, mathematics, manufacturing technology, and technical communications to infuse into courses that comprise a broadly accepted, portable associate's degree in manufacturing. Curriculum materials are based on SCANS competencies. The 5 consortia involved represent two state systems (California and New Hampshire), two industry based (Boeing and AT&T), and one professional society.

- Texas State Technical College at Waco is leading a multi-state effort to develop curricula and laboratory materials for student learning in advanced technologies for 15 occupational areas supporting American machining and machine tool industries. Key goals include providing highly multi-skilled graduates, producing upgraded and new educational materials, working closely with college and industrial partners to validate competencies and materials, and preparing a national model for apprenticeships and internships.

- The South Carolina (SC) Advanced Technological Education Exemplary Faculty Project is bringing together the 16 community colleges in the SC system for intensive professional development activities. In addition, they are developing, pilot testing, implementing, and evaluating curricular reform in engineering technology programs across the state. Partners include Clemson University, the SC Department of Education, and businesses and industries in the state.

In addition to projects above which were submitted to ATE programs, the ATE program co-funded several projects in other programs. For example

- For the 4 Chemistry Initiative awards, the ATE program contributed a total of $350,000 in the first year to assure that curricula developed through those awards is tested in and adapted for appropriate programs such as those that prepare chemical, environmental, or biomedical technicians.

- The ATE program contributed to the award to the Biological Sciences Curriculum Study project. This curricula which is being developed primarily for two-year college biology

classes is being class-tested and adapted for use in technical programs benefiting biotechnology and environmental science.

Special projects supported through the ATE program include:

* The development of the AMATYC Standards for College Mathematics Below the Level of Calculus. These Standards, entitled ***Crossroads in Mathematics***, were released in 1995. They were developed with leadership from the two-year college community; however, members of the writing team also included four-year college and university faculty. These Standards are being supported by major mathematics professional societies including the American Mathematical Society (AMS), the Mathematical Association of America (MAA), the National Council of Teachers of Mathematics (NCTM), the Society of Industrial and Applied Mathematics (SIAM), and many others. The ultimate goal of the project is to improve mathematics education and to encourage more students to study mathematics. Copies can be obtained by contacting AMATYC, State Technical Institute at Memphis, 5983 Macon Cove, Memphis, TN 38134.

* Several national workshops which are being held to address important facets of technician education are being supported including: Critical Issues in Environmental Education (February, 1995), The Future of Engineering Technology Education (October, 1995), Community College Science Connection Conference which addresses articulation issues among two- and four-year institutions (April, 1996), and Ethics and Biotechnology (January, 1996).

* The American Association of Physics Teachers (AAPT) is establishing a network of physics faculty in two-year colleges which consists of 15 regional organizations, coordinated and linked by a national steering committee. The purpose is to help improve learning opportunities for students in two-year colleges including those who transfer, those who become technicians in the high-technology workplace, and all students for whom physics serves as part of their college education.

The projected national impact of the ATE program is large, especially that of the six Centers and large curriculum and faculty enhancement awards. The Northwest Center for Information Technology estimates that it will affect over a five year period more than 5000 ATE college students, 350 ATE faculty and high school teachers, and 2700 high school students. The Environmental Center in the Eastern Iowa Community College District collaborates with Partners for Environmental Education (PETE) to involve over 500 community colleges in their dissemination efforts. They estimate that in the first three years of their award, they will directly reach 300 community college teachers, 300 pre-college teachers, and 5500 students. As a secondary effect, each of the 600 teachers is expected to teach an average of 100 students per year in environmental programs or literacy programs which gives the projected impact around 60,000 students during the award period.

The largest projects are all curriculum development projects which plan to develop and test curriculum nationwide or faculty enhancement activities. For example, The Miami University Middletown project plans to affect 600 pre-college teachers and college faculty in faculty enhancement workshops and 20 in curriculum development efforts. Assuming each teacher or faculty member directly impacts 100 chemistry or chemical technicians students per year, this will result in 60,000 students ultimately being reached by the project. Activities include curriculum development, instructional materials development, faculty and teacher enhancement, and student enhancement and outreach. An industrial internship program for high school and college teachers is an important component.

Table 8
PROJECTED IMPACT OF THE FY 95 GRANTS IN THE ATE PROGRAM

First Year Impact	2340 Teachers/ Faculty	234,000 Students
3-Year Impact	7020 Teachers/ Faculty	702,000 Students

This assumes that each project funded in FY 95 will effect an average of 60 teachers or faculty members and that each teacher or faculty member will directly reach 100 students.

Instrumentation and Laboratory Improvement

The Instrumentation and Laboratory Improvement (ILI) program supports the development of new or improved laboratory courses or experiments in science, mathematics, engineering, or technology. The dominant part of the program is Instrumentation Projects (ILI-IP) which provide matching grants for equipment to carry out a proposed project. These projects then serve as models for the use of instrumentation at other institutions. Grants in the ILI program have been made to over 250 departments in two-year colleges over the past five years. For example, Central Piedmont Community College in North Carolina has students performing nondestructive laboratory work on truss assemblies and members of varying geometry to verify loads and deflections that were predicted by classroom problem solving. This permits students to manipulate physical models in the laboratory to demonstrate topics that rely on problem solving Essex Community College in Maryland is implementing new curricula and pedagogical methods in mathematics and computer science courses so that students adopt a more active role in the learning process. Microcomputer-based classroom laboratories replace the lecture method with problem-driven experimentation and discovery in a wide variety of courses. Valencia Community College in Florida is enhancing their physical science curricula through computer-assisted instruction and data processing. The project is based on the materials developed at the Center for Image Processing at the University of Arizona which help students explore a variety of scientific data sets including earth remote sensing and meteorology data and planetary exploration. Southwestern College in California is improving programs for their biology majors in zoology, cellular processes, and botany. Laboratory exercises are being developed in which students formulate hypotheses concerning effects of several variables, design experiments, and then collect and analyze the data.

The Leadership in Laboratory Development projects (ILI-LLD) portion of the program supports the intellectual effort needed to develop national models for undergraduate laboratory instruction. The ILI-LLD supports project costs beyond equipment. For example, the College of DuPage in Illinois is creating meteorology laboratory modules to improve curriculum and enhance student transitions into upper-division coursework. A laboratory manual is being created consisting of computer programs and forecasting techniques which provide the foundation for the development of courses in weather analysis and forecasting in atmospheric sciences.

Table 9
ILI Proposal Activity By Type Institution
FY 93, FY 94, and FY 95

	1993			1994			1995		
	# Proposals	# Awards	Funding Rate	# Proposals	# Awards	Funding Rate	# Proposals	# Awards	Funding Rate
Doctoral Institution	970	170	17%	666	164	25%	629	145	23%
Four-Year Institution	1022	337	33%	907	334	37%	839	294	35%
Two-Year Institution	204	63	31%	200	59	30%	178	57	32%
Totals	2197	569	26%	1773	557	31%	1646	496	30%

Table 10
ILI Funding by Discipline FY 95

Discipline	# of Awards	Dollars
Chemistry	8	$175,984
Computer Science	1	33,175
Engineering	11	430,166
Geosciences	1	18,940
Interdisciplinary	3	121,220
Life Sciences	17	464,694
Mathematics	11	385,712
Physics	4	85,485
Total for Instrumentation Projects	**56**	**$1,715,356**
Leadership in Laboratory Project Meteorology	1	305,000
Total for Program	**57**	**$2,020,356**

Undergraduate Faculty Enhancement

The Undergraduate Faculty Enhancement (UFE) program supports projects that enable faculty members who teach undergraduate education to gain experience with recent advances and new experimental techniques in their fields and learn new ways to incorporate these into undergraduate instruction. Projects are regional or national in scope and typically consist of hands-on workshops or short courses, along with follow-up activities. For example, the Mathematical Association of America is sponsoring a series of national workshops designed for mathematicians who teach statistics. Workshops goals include increasing emphasis on data and concepts, cultivating statistical thinking, and fostering active learning through alternatives to lecturing. The co-principal investigator is from Austin Community College, and the principal investigator is from Mount Holyoke College. The University of San Diego hosted workshops for instructors of undergraduate marine science courses in two- and four-year colleges that provide faculty the opportunity to update their knowledge and skills in a technologically affected discipline. Kutztown University offered workshops to promote implementation of computer data acquisition and reduction in chemistry laboratories. The 11 two-year college and 27 four-year college and university faculty who attended were provided hands-on experience with interfacing and an opportunity to adapt laboratory experiments using standard hardware and software.

UFE workshops are often held on two-year campuses as well as four-year college and university campuses to encourage collaboration of faculty from many types of institutions. For example, two of the eight workshops for dissemination of the calculus reform projects organized by Macalester College were held at West Valley Community College and Daley College, one of the community colleges that make up the City Colleges of Chicago.

A major component of UFE is regional coalitions of two- and four-year colleges and universities. FY 95 represented the fourth year of the initiative to encourage such coalitions. The coalitions include activities to help faculty learn about new advances in their disciplines and to incorporate these developments into the curriculum. Continuing activities are very important to ensure interaction among coalition members, for that reason coalitions are usually funded for a period of two to three years. These include coalitions of two-year institutions, coalitions of two- and four-year institutions, or projects at four-year institutions primarily for two-year faculty. For example, the University of Maryland College Park, Montgomery Community College, and Prince George's Community College formed a coalition of two- and four-year institutions in the Maryland and District of Columbia area to explore visual thinking in mathematics. Mathematics topics are chosen from chaotic dynamics and fractal geometry. Academic year programs are being conducted in which participants continue the mathematical and curricular dialogue begun during the workshops. Texas A & M University and Lee College formed a coalition for the two-year colleges in Texas. These workshops focus on recent developments in physics research, innovative physics teaching methods, and successful techniques for recruiting local minority students into two-year college science and engineering programs.

Community college faculty also attend many of the other workshops supported by the UFE program. The table below estimates the number of faculty who attended faculty enhancement workshops.

Table 11
INSTITUTIONAL AFFILIATION
OF PARTICIPANTS IN UFE-SUPPORTED WORKSHOPS

	1992 99% (88/89) Reporting		1993 66% (74/112) Reporting		1994 91 %(69/76) Reporting		1995 39 %(35/90) Reporting	
	Number	% Total	Number	% Total	Number	% Total	Number	% Total
Two-Year Col.	594	29%	427	24%	624	30%	292 *	32%
Four-Year Col.	610	30%	547	30%	638	31%	266 *	29%
Universities	834	41%	839	46%	791	39%	359 *	39%
TOTAL	2038		1813		2053		917 *	

* The data at this point is incomplete with statistical information reported by 35 of the 90 workshops (39%) analyzed . It is estimated based on the above data that approximately 2350 faculty participated in the 1995 workshops. While the data is incomplete, the percents are representative, having changed little during the past 4 years. In the 1996 report, the data for 1995 will be updated.

Course and Curriculum Development Programs

Course and Curriculum Development

The Course and Curriculum Development program supports projects to improve the quality of courses and curricula in science, mathematics, engineering, and technology. It encompasses activities affecting the learning environment, content, and experience of instruction. This component seeks projects that envision major changes with potential national impact that result in widely disseminated products such as textbooks, software, and teaching materials. For example, Oakland Community College and the College of DuPage are partnering with Oakland University to develop classroom activities for first-year chemistry which stress active learning and scientific exploration. Topics are being chosen which reflect contemporary science integrated with experiences and interests of students. Project products include nine multimedia modules, student versions of each module, workshops for faculty, assessment materials, and research analyses of the effectiveness of all products. Amarillo College is developing interactive multimedia software for instruction in developmental mathematics. The goal is to immerse students in an interactive simulated learning environment which involves problem solving and review. The software is designed to enhance, but not replace, coursework. North Seattle Community College is developing a year long, team taught pre-engineering program entitled ***Mathematics and Physics: Tools for Careers in Engineering***. By creative scheduling faculty members in physics, calculus, and engineering, the project is integrating coursework to apply concepts in mathematics and physics to problems encountered in the engineering profession. Borough of Manhattan Community College is developing a project which emphasizes the interplay between mathematics and the sciences. Students are being introduced to state-of-the-art technology including CD-ROM and the creation of three dimensional animations using Maple and similar software. A manual entitled ***Portfolios Across Scientific Disciplines*** is being produced.

Calculus and the Bridge to Calculus

While the calculus program has been phased out as a separate entity, several two-year colleges have funding in FY 95 to complete their projects. The purpose of the Calculus Program is to foster improvement in the quality of calculus instruction on the national level. Supported projects include large-scale calculus revision programs, implementation at large institutions or by consortia of institutions, new calculus development projects, and preparation for calculus projects. For example, Peralta Community College District, San Francisco City College, California State University Haywood, and San Francisco State University are preparing faculty to adapt and implement the Harvard Calculus Consortium and evaluating the impact of the programs on student learning. The Maricopa Community College System, with over 100,000 students on 11 campuses, is developing a new bridge to calculus program in cooperation with Arizona State University. Indian River Community College in Florida is developing instructional materials to support the Harvard Consortium materials. The teacher supplement contains examples of using the graphing calculator as an instructional tool, including generation of real data using the Calculator Based Laboratory System (CBL). The materials integrate practical applications taken from astronomy and physics and other disciplines that use mathematics. Dutchess Community College in New York continues to create an integrated calculus/physics sequence. A consortia of two- and four-year institutions in the state of Washington continues to disseminate and adapt as well as evaluate the use of both the Duke and Harvard materials throughout the state. North Harris, Sam Jacinto Central, and Tomball Community Colleges are partnering with Sam Houston State University to create a network of 28 community colleges and comprehensive universities to reform their calculus curriculum. Colleges are using student activities and customized instructional methods from other calculus reform efforts. The methods integrate cooperative learning, graphing technology, and writing. Workshops are being conducted to involve other institutions outside the consortium and additional faculty members within the consortium.

Many community colleges are being affected by other calculus reform efforts. SUNY Suffolk Community College is part of the Harvard Calculus Consortium. Montgomery College is part of the Howard Consortium. In addition, many two-year colleges have adopted the reform calculus texts supported through the NSF Calculus Program.

Science and Humanities: Integrating Undergraduate Education

In 1995 the Division of Undergraduate Education at NSF and the National Endowment for the Humanities Division of Education (NEH) instituted **Science and Humanities: Integrating Undergraduate Education**. This is a successor to the joint NSF/NEH, and Fund for the Improvement of Postsecondary Education (FIPSE) at the Department of Education program which ran from 1992 - 1994 entitled **Leadership Opportunity in Science and Humanities Education (CCD-LOSH)**. FY 1995 was the last year of funding for this program. Both programs sought projects for the development of undergraduate courses and curricula that meaningfully link the study of science and the humanities. For example, Borough of Manhattan Community College is developing a program that includes faculty development workshops, released time, and summer support for the design and implementation of four courses that are part of an integrated science, technology, and society program. Community colleges also continue to be supported through grants made in previous years in the original program. Middlesex Community College is developing faculty seminars and subsequently four core courses involving environmental, industrial, sociological, and literary histories of Lowell, Massachusetts. Holyoke Community College in Massachusetts is implementing five general education interdisciplinary learning communities and developing new interdisciplinary courses to support those communities.

Division of Elementary, Secondary, and Informal Education (ESIE)

Programs are designed to improve the educational experiences of all students in school settings and to increase and improve the opportunities for all individuals to explore science, mathematics, and technology beyond the school setting. The Division seeks to achieve these goals by supporting projects to develop and implement high-quality instructional materials; enhance the mathematical, scientific, pedagogical, and technological knowledge of teachers and create a cadre of teacher change-agents, and provide stimulating environments outside of school to increase the understanding and appreciation of science and mathematics and their applications by individuals of all ages.

ESIE directly supported two-year colleges in FY 95 through the following programs.

- **Advanced Technological Education (ATE)** for the development of courses, curricula, and faculty and teacher development to improve the quality of the education for science and engineering technicians.
- **Teacher Enhancement (TE)** for professional development programs that lead to a new level of teacher competence and a supportive school culture that empowers teachers to engage all students in science, mathematics, and technology education.
- **Young Scholars (YS)** to excite students in grades 7 - 12 about science, mathematics, and technology and to encourage them to investigate and pursue careers in these fields.

Table 12

DIVISION OF ELEMENTARY, SECONDARY, AND INFORMAL EDUCATION (ESIE) FY 94 AND FY 95 GRANTS TO TWO-YEAR COLLEGES BY PROGRAM

Program	# Awards	FY 94 Dollars (in $1000s)	# Awards	FY 95 Dollars (in $1000s)
TE	6	$1,058	3	$1,475
YS	8	430	9	430
ATE	40	4,479	63	6,970
Totals	**54**	**$5,967**	**75**	**$8,875**

ESIE contributed funds to 40 of the 58 awards made in the ATE program and to all of the FY 95 awards. The dollars reported are 1/3rd of the total dollars awarded since the funds were divided 2/3rds DUE, 1/3rd ESIE. In Tables 1 and 2 the number assigned to ESIE is 21 or 1/3rd of the awards to avoid double counting.

Dollars reported are only FY 94 dollars and FY 95 dollars respectively. Total commitment for these awards including out-year funding totals about $13 million in FY 94 and $17 million in FY 95.

Advanced Technological Education

The purpose of the new ATE program is to promote exemplary improvement in advanced technological education at the national and regional level through support of curriculum development and program improvement for technicians being educated for the high performance workplace of advanced technologies. The focus of the ATE program is to develop strategies to strengthen two-year college technician education and to improve the education of prospective technicians at the secondary school level. Expanding opportunities for technicians at four-year colleges and universities and after employment are also addressed. Those projects and Centers supported through the ATE program will result in major improvements in advanced technological education, build collaborations among academic institutions and between academe and industry, serve as models for other institutions, assure that students acquire strong backgrounds in mathematics and science, and yield nationally-usable educational products. For example, the American Chemical Society is developing, in collaboration with two-year college faculty, curriculum materials for secondary school chemistry technology programs which will prepare students to enter chemistry technician programs and other technical programs in two-year colleges. The project is entitled ***Science Technology: Knowledge and Skills***.

A full report on the FY 95 ATE program can be found in the NSF publication *Advanced Technological Education: 1994 Awards and Activities* and a more complete description in the section of this document on undergraduate education. Please consult these for a more comprehensive description of the program including abstracts of awards.

Teacher Enhancement

All teachers must continue professional development and renew career commitments. Well-prepared teachers need to engage in activities that enrich and strengthen their teaching; to influence and improve the teaching of their colleagues; and to be recognized for their efforts. Teacher Enhancement (TE) supports development of effective approaches and creative materials for the continuing education of elementary, middle, and secondary teachers of science, mathematics, and technology. Successful projects emphasize both content and pedagogy, help teachers develop and exercise leadership qualities, and provide opportunities for continuing professional growth and interaction. Projects typically involve intensive summer workshops followed by activities during the academic year. For example, the two-year campus of Miami University at Middletown is cultivating district systemic implementation of toy-based physical science education. Teams of teachers and administrators participate in summer workshops which include working directly with students. Academic year follow-up includes fall and spring sessions where participants report on activities and exchange information.

Young Scholars

Commitment and preparation for careers in science, mathematics, engineering, and technology, or education in these fields begin during secondary school years. The Young Scholars (YS) Program, which targets high-potential and high-ability youth in grades 7 - 12, is designed to inform and excite students about these disciplines and to encourage them to investigate careers in these fields. The YS program strongly emphasizes student participation in the process of scientific discovery through interaction with practicing scientists and science educators both in the laboratory and in the field. Projects offer a combination of instruction, research, and problem-solving activities along with a discussion of career preparation and science ethics. For example,

Prince George's Community College is engaging students in research in the following areas: endangered cranes with the Patuxent Wildlife Research Center, aquatic ecology at the University of Maryland's Chesapeake Biological Laboratory; osprey banding and behavior study at Patuxent River Park; and turfgrass research at the University of Maryland's Turfgrass Research and Education Facility.

Division of Human Resource Development

The programs in the Division of Human Resources Development (HRD) reflect the Foundation's commitment to developing the resources of the scientific and technical community as a whole. The Division has primary responsibility for broadening participation of underrepresented groups in science, engineering, and mathematics (SEM). The Division operates and coordinates a range of programs that focus on increasing the presence of minorities, women and girls, and persons with disabilities in SEM.

Alliances for Minority Participation

The Alliances for Minority Participation (AMP) program at NSF is a comprehensive and multidisciplinary undergraduate program designed to significantly increase both the quality and the number of baccalaureate degrees in science, engineering, and mathematics (SEM) earned by groups who are underrepresented in SEM. AMP supports alliances via cooperative agreements that contain each alliance's goal (the current number of minorities obtaining BS degrees in SEM and the alliance's five year goal) and specific work statements that describe how the alliance will achieve its goal. AMP institutions are committed to better serve all SEM students today and to institutionalize changes that will ensure that all students have access to quality SEM educational opportunities.

Alliances establish partnerships among community and other two-year colleges, four-year colleges and universities, school systems, other government agencies, major National SEM laboratories and Centers, industry, private foundations, and SEM professional organizations as necessary to achieve AMP objectives. Two-year colleges are involved in virtually every AMP project in significant ways.

For example, the Philadelphia Alliance, new in FY 95, includes seven diverse four-year colleges and universities and the Community College of Philadelphia. A critical component of the Alliance's developing strategy on articulation is that support for student transfer must transcend simple articulation agreement. The support systems of the community college and the four-year receiving institution are being integrated so as to make the transition truly seamless from the student's point of view. A new strategy which is being implemented allows students to make the transition gradually through concurrent enrollment. Most significantly, the Alliance's concurrent enrollment programs are structured, rather than simply allowing community college students to "sample" courses at four-year institutions.

Another example is the New York City Alliance, a coalition of sixteen colleges within the City University of New York (CUNY) who shares a five-year goal of doubling the number of underrepresented minority students earning degrees in science, mathematics, engineering and technology. The project is leading a change in the teaching of mathematics and science, especially at the introductory level. The new approach emphasizes problem-solving and collaborative learning. Alliance initiatives are improving the articulation between community and senior

colleges. The coalition includes 7 community colleges, 8 senior colleges, and 1 technical college. One of the four project directors is from Bronx Community College.

Eighteen campuses of the California State University (CSU) system are each paired with a feeder two-year college member of the state community college system. One focus of the alliance is a sequence of supplemental workshops to which a group of minority students are asked to make a commitment. In the summer before their freshman year students take a four-week summer workshop focusing on entry-level mathematics courses followed by a year long workshop which parallels and supplements the students' freshman year courses in mathematics. In the second year, students attend another four week summer workshop which focuses on physics, chemistry, or biology combined with appropriate mathematics. The second workshop was followed by a year long workshop focusing on science. All workshops are located on one of the CSU campuses, but academic year activities take place at both the CSU campuses and the community college locations.

Texas A&M leads the Texas AMP. This alliance helps remove obstructions that minority students face at four year institutions and creates a pipeline between community colleges and four-year institutions. Active and lead AMP institutions includes 5 four-year institutions and many community colleges. Two activities which specifically promote the pipeline between community colleges and four-year institutions are the Trans-Texas Videoconference Network and the Office of Transfer and Articulations. In addition, two-year college students are recruited for industry internships.

The All-Nations Alliance for the American Indians has developed and implemented innovative programs with input from both the Indian community and the SMET community to enhance matriculation of the American Indians at three critical transition points, two of which involve community colleges: (1) high school to tribal, community and four-year college, (2) tribal, and community two-year college to four-year, and (3) four-year institutions to doctoral-granting programs in SMET fields. The two lead institutions are Salish Kootenai College (SKC), a tribal college, and Montana State University, a SMET baccalaureate and doctoral degree granting institution.

By the end of the 1996 spring semester, students who started as first year students in the first six AMPs in 1992 will be completing their fourth year of study.

Other HRD Support

In addition to the AMP program, HRD directly supported two-year colleges through the **Summer Science Camps** Program, the **Model Institutions for Excellence**, and the **Research Careers for Minority Scholars**.

Summer Science Camps is a program designed to increase student interest in and exposure to science and mathematics. It targets the middle school years where students begin the crucial study of science and mathematics and to explore career options. Specific objectives include: (a) strengthening student commitment to remain in school and continue the study of science and mathematics; (b) illustrating the importance of science, mathematics, and communications in daily life; (c) exposing students to a broad range of participatory activities in science, mathematics, and technology including the research process and interactions with practicing scientists, engineers, and mathematicians; (d) offering students information and guidance in the career exploration including the academic preparation necessary for a variety of professions; and (e) heightening student awareness of science and mathematics disciplines as potential career choices including attention to precollege level science teachers. For example, Santa Fe Community College is

providing an intensive four week summer camp and follow-up activities for African-American students beginning in the seventh grade and continuing through the ninth grade. Students are actively involved in doing experiments which provide problem solving to facilitate the understanding of mathematics to physical situations. Students must also write and explain about both the processes and results of experiments. The Roanoke River Valley Consortium which involves two-year and four-year colleges is focusing on the physical science disciplines infused with mathematics and integrated with life and earth science to create a cohort of 150 eighth grade African-American students who are interested in science and mathematics as possible career options. The project involves summer residential camps, field trips, and extensive academic year follow-up activities.

The NSF **Model Institutions for Excellence** initiative offers an opportunity for Oyate Tribal colleges and their 26 tribal counterparts to reach underrepresented American Indian students and to bring academic and technical expertise to Tribal nations in ways that may make the difference between extinction and tribal self-sufficiency. In this program Cheyenne River Standing Rock, and Sisseton Wahpeton Community Colleges are joining with Oglala Lakota College and Sinte Gleska University to develop programs in environmental science and software engineering.

The **Research Careers for Minority Scholars** program is intended to provide talented students with support and an enriched environment within the grantee institution and other participating institutions. These project emphasize factors that contribute to entry and retention of minorities in science, engineering, and mathematics (SEM) such as: (a) early research experiences with dedicated mentors and role models; (b) academic enrichment, mentoring, and counseling to enhance student self-confidence, interest, and desire to achieve in SEM careers, (c) strong leadership, commitment to the program, and continuity of effort, (d) partnerships among institutions with strong records of training minority students, institutions with strong research programs, and industrial and government laboratories, and (e) greater interaction among parents, educators, scientists and engineers, and school counselors. For example, Navajo Community College is operating a Science Honors Program that incorporates academic enrichment, cooperative learning and research placements in universities, national laboratories, and private industry. This is preparing an increasing number of Navajo students for science careers. Mathematics workshops for calculus classes in this project are modeled after successful programs for minorities at University of California Berkeley and California Polytechnic Institute.

The EHR **Model Projects for Women and Girls** seeks to encourage the design and implementation of innovative, short term, and highly focused activities, strategies, and materials to improve educational achievement and to encourage entry and improvement of women and girls into SEM fields. For example, the Turtle Mountain Community College project is designed to stimulate interest, increase participation, improve achievement, increase visibility, and accelerate career advancement and success in mathematics and related areas for young women on the Turtle Mountain Reservation and provide a model that can be replicated on other reservations. The girls in the program are involved in problem solving activities with an emphasis on applications. Much of the data is being collected during field trips to cultural sites on the reservation.

Other EHR Support

Two-year colleges are also receiving support through the **Division of Research, Evaluation, and Communication (REC)** and the **Division of Educational Sytem Reform (ESR)**. The Office of Systemic Reform (OSR) supports the state systemic initiatives, the urban systemic initiatives, and the rural systemic initiatives. Community colleges are involved as appropriate in numerous state and urban systemic initiatives; however, the focus of these programs is to improve science,

mathematics, engineering, and technology education for grades pre-K through 12. The Rural Systemic Initiative (RSI) involves community colleges in more substantive ways.

Networking Infrastructure for Education

The **Networking Infrastructure for Education** (NIE) Program is designed to build synergy among technology and education researchers. The NIE program is a joint effort between the Directorates for Computer and Information Science and Engineering (CISE) and Education and Human Resources (EHR). The aims of the NIE Program are to expedite the development of a widespread high performance electronic communications infrastructure in support of science, mathematics, engineering and technology (SMET) education reform, and to lay a foundation on which strategies for the appropriate use of technology in support of increased student achievement can be developed. NIE awards build synergy between technology and education researchers, developers, and implementers to explore networking costs and benefits, test self-sustaining strategies, and develop models of a flexible educational networking infrastructure that will speed the pace of educational innovation and reform.

The NIE Program supports projects in the areas of: (a) programmatic evaluation of the impact of existing technology programs on the infrastructure of education, and on systemic reform; (b) widespread dissemination to appropriate audiences of the outcomes of existing models both successful and unsuccessful; and (c) electronic library implementation prototypes. Many projects funded by NIE include collaborations of groups interested in mathematics and science education. Two-year colleges are often represented on such teams, and participate through advisory committees and dissemination and outreach activities. For example, the New Jersey NIE project is doing work with community colleges in collaboration with the NJ Statewide Systemic Initiative. The HERN project at the University of Hawaii is training faculty from community colleges. They are providing the mechanisms through which community colleges are working with K-12 faculty to articulate common educational goals and concerns.

In three projects, two-year colleges are the lead institutions. For example, NIE is providing support is for initial implementation phases of the Navajo Learning Network (NLN) based at Navajo Community College (NCC), a four-part project with the overall objective of establishing a single virtual campus linking all educational institutions within the Navajo Nation. Teaching, research, and curriculum development activities are being carried out collaboratively by K-12 as well as NCC faculty and students. A base level of connectivity between participating institutions is being accomplished utilizing the wide-area network developed by the Navajo Nation government that connects participating Navajo Nation K-12 schools to Navajo Community College's system and out to the Internet. The NLN project team, together with trainers from the Los Alamos National Laboratory, provides training both on NLN and Internet access, and works closely with NCC and K-12 faculty to develop effective strategies for utilizing information technology as a teaching and learning tool in a way that is sensitive to the learning styles prevalent among Navajo schoolchildren. The planned information technology upgrade is necessary to provide expanded education and support services to the entire NCC campus system, and ultimately to all residents of the Navajo Nation, an area of approximately the size of West Virginia (25,000 square miles), covering portions of Arizona, New Mexico and Utah. Currently, over 200,000 Navajos live on or near the reservation.

The NIE project led by Stone Child College in Montana is designed to achieve educational objectives through video and data interconnections. The educational purposes include the development of new networking and user service training programs for both video and data networks, improvement of the teaching of SMET subjects in K-12 and postsecondary institutions that are controlled by Indians, and the improvement of education for American Indians in the health fields. The general concept of this application is to maximize the impact that already

existing SMET coursework and programs have. This will be done by distributing the responsibility for offering programs throughout the video and data networks. Because the 29 institutions that comprise the American Indian Higher Education Consortium (AIHEC) are widespread, generally small, and chronically underfunded, there has always been an emphasis on sharing resources. There is wide variance among the institutions with regard to levels of SMET curriculum and the level of networking currently available. This interest in sharing through networking led to the formation of the AIHEC telecommunication project five years ago, to make use of technology to make limited resources go further. Since that time, there has also been solid interest in the establishment of computer interconnectivity. Approximately half of the colleges have such connectivity. This project calls for funding for one year for developing programs that provide both short-term training in such things as using the Internet and interactive video, and technical support for networks. In the technology area, it also calls for the development of associate degrees in areas that provide user support. A second area of development in this first year is the Health Services area. AIHEC is identifying areas of greatest need with the Indian Health Service and developing distributed programs in these areas. The colleges need things to make these operations possible. First, they need faculty with upgraded academic preparation in SMET areas and students who are better prepared. Thus, there is a project component that provides for distributed graduate education for both college and K-12 teachers. For infrastructure, many colleges do not have connectivity yet. For this reason, all the Tribal Colleges in Montana are being linked with a system that they have designed to provide maximum capability for upgrading. Finally, the AIHEC Telecommunications Network is being utilized by providing uplinks to satellites at three sites, one each in Minnesota, Montana, and North Dakota. These uplinks are capable of providing instruction to all 29 colleges while 7 of the colleges will be able to originate programming.

Rural Systemic Initiatives

The **Rural Systemic Initiatives** in Science, Mathematics and Technology Education Program (RSI) completes the trilogy of educational systems reform initiatives in EHR. The goal of the Rural Systemic Initiatives (RSI) is to promote systemic improvements in science, mathematics, and technology education for students in rural, economically disadvantaged regions of the nation and to ensure sustainability of these improvements by encouraging community development in conjunction with instructional and policy reform. In addition, programs should help prepare a technologically competent workforce to enhance the infrastructure of economic development activities within a community or region by strengthening the science, mathematics, and technology instructional capacities of regional colleges and universities, particularly community and technical colleges responsible for technician education. Programs also strengthen other lower division instruction of technical curricula and entry-level science and mathematics curricula of the future teaching workforce. These collaborations extend across K-12 school systems and into institutions of higher education. Each of the RSI projects includes participation of two-year colleges and other institutions which award associate degrees.

In FY 94, the RSI Program made four development awards (average award size $250,000) and two planning grants (approximately $60,000 each). These collaborations extend across K-12 school systems and into institutions of higher education resulting in the meaningful alignment of funding, curriculum, instruction, assessment, teacher preparation, and guidance systems. All consortia include two-year colleges or institutions which offer associate degree programs.

In FY 1995, the RSI Program awarded four implementation phase grants (average award of $2 million). This phase focuses on systemic and sustainable improvements and policy alterations that have a direct or secondary impact on classroom instruction and student achievement.

such as teaching workforce enhancements, curriculum innovation, leadership development among teachers and local district administrators, and innovative and pertinent assessment strategies. The RSI program also funded one developmental grant (award of $250,000) and a second developmental grant was continued for a total of six ongoing projects.

The collaboratives which include two year college representation are geographically and intellectually related networks established to address local challenges, goals, and commitments. The collaboratives will be located at regional institutions of higher education, and will serve as conduits of information and expertise between the students and the outside world. For example:

- The ***High Plains Rural Systemic Initiative (HPRSI)*** brings together 17 American Indian tribal colleges and other entities involved in science, mathematics, engineering, and technical education in Montana, Nebraska, North Dakota, South Dakota, and Wyoming. The initial implementation activities will begin at colleges that serve six reservation areas. These locations have Internet access, interactive video, and up-down link satellite transmission. HPRSI will direct capacity building at the other colleges, and will have implementation activities instituted at all 17 sites within 3-5 years. This initiative is seeking to identify and coordinate efforts to remove impediments for exemplary student performance in SMET education among American Indians.

- The ***Appalachian Rural Systemic Initiative (ARSI)*** is a collaborative implementation initiative among six states (Kentucky, North Carolina, Ohio, Tennessee, Virginia, and West Virginia) comprising the central Appalachian region. ARSI facilitates site-based management and educational systemic reform by establishing "Resource Collaboratives." The coalition is directing, facilitating, and organizing a series of activities designed to determine needs and strategies for systemic educational reform in a geographically challenged and economically depressed area.

LEVERAGED PROGRAM SUPPORT: RESEARCH DIRECTORATES

NSFNET and Network Infrastructure Program

NSFNET and the Network Infrastructure Program encourages and facilitates scholarly communication and collaboration by providing data network access to researchers and educators, supercomputer Centers, and information resources. These programs support expansion, operation, and use of the NSFNET backbone service and assist mid-level networks, and support network connections from institutions of higher education to mid-level networks. In FY 95, NSFNET and the Network Infrastructure Program supported direct access for 17 two-year colleges for connections to the Internet. Other two-year colleges were supported through larger grants which help consortia of institutions gain access to internet capabilities.

For example, Hiwassee College, Tennessee Wesleyan College, Monroe County Vocational School, and four area high schools are connecting to NSFNET through SURANET, a midlevel network in the southern United States. The benefits include email, file transfer capability, and the ability to use remote computer resources. These colleges and high schools now have the ability to investigate innovation in educational resources and incorporate them into their curricula. The Community College of Allegheny County is using NSF support through the Network Infrastructure Program to connect to PREPnet, a mid-level network in the state of Pennsylvania. This gives the college greater functionality and network speed to be able to access supercomputers, libraries, and make file transfers. The connection is benefiting faculty research, staff, classroom activities, and students.

Technology Reinvestment Project (TRP)

The mission of the Technology Reinvestment Project (TRP) is to stimulate the transition to a growing, integrated, national industrial capability that provides the most advanced, affordable, military systems and the most competitive commercial products. While the TRP program did not make any new awards in 1995, numerous two-year colleges are still being supported through the program either by awards made directly to them or through consortia arrangements.

The TRP encourages and pursues its goal of industrial base integration through competitively selected technology proposals. The unifying theme of all funded activities is that investments in dual-use technology development, deployment, and education will offer significant advantages to the military security of the nation and lead to flexibility, affordability, and competitiveness for American firms internationally. The TRP is divided into four related competition areas: Technology Development to promote the development of dual-use technologies; Regional Technology Alliances to enhance regional industrial capabilities that are important to national security; Manufacturing Education and Training to establish programs for the retraining of Defense workers and improvement of the manufacturing curriculum in U. S. colleges and

universities, and Small Business Innovation Research to encourage scientific and technical innovations by small businesses

Manufacturing covers a wide range of technologies and concepts, and encompasses the full spectrum of materials, products, and processes upon which the American industrial enterprise is based. In the context of the Manufacturing Education and Training (MET) competition, manufacturing includes the full range of economic activities from chemical and biotechnology processing to electronic component and system fabrication, durable goods production, fabrication of structures, and other manufacturing sectors. Activities in the MET area focus on upgrading individual skills with the aim of producing a world-class, flexible manufacturing workforce that will function effectively under both Defense and commercial production regimes. They also focus on providing the highly-skilled, flexible, technical workforce of the future

TRP/MET activities provide Defense and commercial engineers and technicians with improved knowledge of manufacturing engineering, science, and mathematics so they may more effectively contribute to the global competitiveness of the United States industry. Emphasis is on dual-use manufacturing engineering skills and business knowledge. Activities target the improvement of curriculum and educational tools at universities, two- and four-colleges, technical and vocational schools, and pre-college educational institutions, and emphasize partnerships among these educational institutions. Activities place special emphasis on skill conversion for engineers, technicians, and other professionals displaced by the Defense draw-down

Two-year colleges were supported in most of the areas either directly or as part of consortia activities. Most of the direct support however was through the Manufacturing Education and Training (MET) area which is administered through NSF. In FY 94, six two-year institutions were directly supported by TRP/MET awards. Five additional awards have two-year college co-principal investigators and significantly involve two-year colleges in project activities. These all continue in 1995 with considerable financial support

For example, South Seattle Community College is leading a consortium involving Boeing Corporation, Eldec Corporation, Clover Park Technical College, and 12 other institutions to develop a process for determining specific workplace standards for manufacturing education and training. Workplace-based internships are an integral part of the curriculum which begins in high schools and feeds into a 2 + 2 Tech Prep post-secondary community college program. Drexel University, Camden County College, Delaware Community College, and the Community College of Philadelphia are creating a program to retrain displaced defense industry personnel. Industry involvement includes participation on advisory boards, curriculum development, and adjunct teaching. Erie County Technical Institute is leading a consortium of 30 colleges and universities in cooperation with eight metal products and tool and die firms to develop courses for workers in two- and four-year degree programs in manufacturing.

Other Selected Examples

The **Research Experiences for Undergraduates** program is supported by all the Foundation's disciplinary research programs. It provides opportunities for undergraduate students to experience hands-on participation in research or related scholarly activities in areas of science, mathematics, and engineering. Through the Directorate for Biological Sciences with partial support from the ATE program in DUE, Massachusetts Bay Community College is developing an innovative summer program which targets students from two-year colleges. During the first two summers, students are being extensively trained in various techniques used in molecular biology and biotechnology research. During the third summer participants will use this technical knowledge to pursue independent research at the Marine Biological Laboratory in Woods Hole.

This research institute is designed to provide students preparation both for graduate school and the workplace

Through the **Chemical Instrumentation Program** the two-year Pennsylvania State University Delaware Campus is acquiring a Bruker AC-80 Nuclear Magnetic Resonance (NMR) Spectrometer for use with their undergraduate students

Faculty from Bishop State Junior College are working with faculty at the University of South Alabama on the use of a scanning electron microscope and x-ray diffractometer The microscope is being used to support curriculum development and research in a **Materials Science Laboratory**

NOTES ON SOURCE OF DATA

The data provided in Tables 1,2,3,4,9, 10, and 12 came primarily from the NSF Main Database. For programs in EHR this was cross-checked against data that is collected by the programs and by program award sheets. Data concerning previous years funding came from reports prepared and published in 1994 and 1995 about awards in 1993 and 1994. Continuation numbers were collected by checking awards to two-year colleges made in 1992 - 1994. Information was further verified by reading abstracts. In a few cases, two-year institutions were not coded as two-year institutions in the main database. In other cases, institutions that have changed their status from a two-year institution to a four-year institution are still coded as two-year institutions in the main NSF database. These were not included. Data in Table 5, 6, 7, and 8 were supplied from the NSF Main Database and the ATE Program records and verified by reading abstracts from the Advanced Technological Education (ATE). Data in Tables 9 and 10 came from the Division of Undergraduate Education Instrumentation and Laboratory Improvement program records and the NSF database. Data in Table 11 came from information provided by the principal investigators of Undergraduate Faculty Enhancement projects.

Summaries include awards where either the principal investigator or a co-principal investigator was from a two-year college. The exceptions to this are in the Alliances for Minority Participation (AMP), the Statewide Systemic Initiative (SSI), the Urban Systemic Initiatives (USI), and the Collaboratives for Excellence in Teacher Preparation (CETP). It is difficult to determine the direct benefit to two-year colleges through these programs, although it is recognized that the benefit is substantial. Because the awards in these programs are very large and the number of principals investigators is often large, it was determined that including those amounts would skew the data. A conservative estimate is that 10% to 25% of those projects directly benefit two-year colleges. In addition, conservatively, it is also estimated that most of the other AMP, SSI, and USI projects also provide 1% to 25% direct benefit to two-year colleges.

This report was prepared by the Division of Undergraduate Education. All information provided in the report has been verified and cross checked. While every effort was made to secure information from other sources, some information may be missing. In addition, program officers in ESIE, HRD, REC, CISE, and ESR reviewed the information provided in this report.

Appendix I
National Science Foundation
Recommendations from Community College President Meeting at NSF

On Monday June 12, 1995 the Directorate for Education and Human Resources (EHR) hosted a meeting, with cooperation from the American Association of Community Colleges (AACC), of 12 community college presidents. Included among the agenda items for the meeting were: (a) federal support of science and technology in community colleges, (b) the educated workforce, (c) teacher education in community colleges, (d) NSF Leadership activities, (e) using federal support to leverage other funds, (f) NSF Advanced Technological Education (ATE) program, and (g) other NSF programs. The following are synopses of the recommendations that these college presidents made to NSF. These recommendations are currently under review at NSF.

- **Teacher Education**

Community colleges are an important asset and can play a key role in science and mathematics preparation and enhancement of K- 12 teachers. In particular, two-year colleges are the starting sites for many mathematics, science, and technology teachers as well as K-8 teachers who may teach mathematics and science in addition to other courses. The community colleges need however to work with four-year institutions in these activities and may need to give credit for teacher enhancement instruction under the auspices of four-year colleges and universities. The Presidents recommended NSF provide greater opportunities to community colleges for participation in the teacher enhancement and teacher preparation programs. Such recognition by NSF would influence state universities to work with their local community colleges. Special emphasis should be given to involving those colleges with large potential for transferring minority students as major partners in the planning and implementation of Teacher Preparation and Teacher Enhancement projects.

- **Technological Society**

In order for U.S. business and industries to continue to develop and produce high tech consumer goods, consumers must also become technologically literate and sophisticated. Consumers sometimes cannot use the products they purchase. Without more literate customers, industry may lack an educated consumer base for its products. NSF needs to continue its emphasis for science, mathematics, engineering, and technology education for all students at K-12 and undergraduate levels.

- **Faculty Development**

Community college faculty, because of the institutional mission and their individual commitment to undergraduate education and teaching, often are not in the main stream of the education and research enterprise. In addition, a large majority of community college faculty have been at their institutions for 20 plus years. It is critical that these faculty be kept current with state-of-the art technology and pedagogical issues. Because industry and business treat education like any other vendor, there must be "world class" teaching as defined by the companies. The challenge is to get and keep the two-year college faculty ready to respond to the challenge. Although much of the faculty development can be undertaken locally, NSF can provide valuable leadership and resources toward this effort.

- **Secondary School Students**

About 50% of the students in secondary schools are in college preparation or technical or vocational programs. The other 50% are not focused in any direction and take courses that often lead nowhere. Counselors must screen students into those areas which are mathematics, science,

and technology driven. This is particularly crucial for minorities including those students in tribal colleges, many of whom are also bilingual. Summer enrichment programs in mathematics, science, engineering, and technology should be made available for all students, not just high achieving ones.

- **Technological Workforce**

In 1960, 20% of the labor force needed a baccalaureate degree and 15% were needed as technicians. In 2000 20% will still need a baccalaureate degree while 65% will be needed as technicians. In most instances community colleges are the primary or only source for technical workforce preparation in many communities. Community colleges meet their challenges by providing a broad range of services at a very low cost. The colleges work very closely with local industries and businesses for providing training and re-training activities for current workers. They also offer specialized and comprehensive associate degree technology programs for new high school graduates, prepare underrepresented minorities for the present workforce, and provide literacy and technical skills to under-prepared, young, and adult students. In addition, in recent years many community colleges have taken on the challenge and role of providing highly specialized training and education to bachelors and masters degree professionals. The Presidents recommended that there be a long term investment in education and people. Short term training simply does not work. A model that is worth further investigation is one year of basic education, two years of more technical education, and a year of follow-through. NSF can help community colleges meet local and regional obligations of providing a highly skilled workforce. In order to maintain the U.S. competitive edge in the world marketplace, technological programs must be at the world class level. Special consideration should be provided ATE Centers or projects proposing to increase the participation of minorities.

Appendix II
National Science Foundation
FY 95 Awards to Two-Year Colleges
Two-Year College Principal Investigator or Co-Principal Investigator

The awards in this appendix are ordered alphabetically by state, then by Division, by Program within the Division that made the award, and lastly, by proposal number. This list does not include the special grants made to two-year colleges for IPA positions. The co-principal investigators are only listed when the grant was made in programs other then Advanced Technological Education to four-year colleges and universities. This section only lists grants where FY1995 monies went to the institutions. Many two-year colleges continued to be supported in FY1995 through multiple year standard grants made in FY1992 - FY1994.

The following acronyms identify the Divisions with awards in this list.

BIR	Division of Biological Instrumentation and Resources
CDA	Office of Cross-Disciplinary Activities
CHE	Division of Chemistry
DUE	Division of Undergraduate Education
DMR	Division of Materials Research
ESI	Division of Elementary, Secondary and Informal Education
EW	Leadership Opportunities in Science and Humanities
HRD	Division of Human Resource Development
IBN	Integrative Biology and Neuroscience
NCR	Division of Networking and Communications Research and Infrastructure
ESR	Educational Systemic Reform (Previously the Office of Systemic Reform)
REC	Research, Evaluation, and Communication

The awards appear in the following format:

Project Title
PI: Principal Investigator — NSF Program under which the proposal was submitted
Awardee Institution — Division-Proposal #
Street Address — FY1995 Dollars (Total Award Amount)
City, State, Zip Code — Major Discipline

ALABAMA

Title: Acquisition of Scanning Electron Microscope and X-Ray Diffractometer for Multi-disciplinary Research and Education

David Hayhurst
Bishop State Jr College
351 North Broad
Mobile, AL 36603-5833

National Facilities & Instrumentation
DMR-9512324
FY1995 $111,601

Title: Jefferson State Community College Physics/Physical Science Laboratory Enhancement Project

Ali Yazdi
Jefferson State Community College
2601 Carson Road
Birmingham, AL 35215-3007

Instrumentation & Laboratory Improvement
DUE-9552189
FY1995 $12,167
Physics

ALASKA

Title: Rural Alaskan Environmental Education Program

John W. Carnegie
University of Alaska Southeast
Sitka Campus
Sitka, AK 99835

Advanced Technological Education
DUE-9553680
FY1995 $ 250,000 ($600,00)
Environmental Technology

ARIZONA

Title: Image Processing for Teaching: Faculty Development and Curriculum Materials

Melanie Magisos
Center for Image Processing in Education
5343 E. Pima Street, Suite 201
Tucson, AZ 85712

Advanced Technological Education
DUE-9454520
FY1995 $466,493 ($1,346,831)
Computer Information Technology

Title: Computer Applications to Enhance Inquiry - Oriented Laboratory Instruction in Biology at a 2-year College

William B. Kincaid
Mesa Community College
Tempe, AZ 85202

Course & Curriculum Development
DUE-9254228
FY1995 $83,117 ($297,482)
Biology

Title: Automated Data Collection in the Chemistry Laboratory

Douglas J. Sawyer
Maricopa County Community College District
Tempe, AZ 85281-6941

Instrumentation & Laboratory Improvement
DUE-9551872
FY1995 $9,932
Chemistry

Title: Seamless Integration

Alan Jacobs
Scottsdale Community College
9000 East Chaparral
Scottsdale, AZ 85250-2614

Instrumentation & Laboratory Improvement
DUE-9551867
FY1995 $29,089
Mathematics

Title: Navajo Community College Science Honors Program

Mark Bauer
Navajo Community College
Tsail, AZ 86556

Research Careers for Minority Scholars
HRD-9550752
FY1995 $99,999
Interdisciplinary

Title: The Navajo Learning Network Project

David Basham
Navajo Community College
Tsail, AZ 86556

. . Network Infrastructure
REC-9554344
FY1995 $449,982 ($832,006)
Interdisciplinary

CALIFORNIA

Title: Preserving the Legacy: A Comprehensive Curriculum and Materials Development Project in Support of Advanced Environmental Technology Education

Sally V. Beaty
Intelecom Intelligent Telecommunications
150 East Colorado Boulevard, Suite 300
Pasadena, CA 91105

Advanced Technological Education
DUE-9454521
FY1995 $ 499,989 ($1,500,000)
Environmental Technology

Title: Advanced Biotechnology Education Project

Shahla Sheikholeslam
De Anza College
21250 Stevens Creek Boulevard
Cupertino, CA 95014

Advanced Technological Education
DUE-9553708
FY1995 $225,306
Biotechnology

Title: Theme Curriculum: An Integrated Curriculum Development Project in Support of Advanced Technology Education

Dave Sinclair
Los Rios Community College System
Department of Design Technology
4700 College Oak Drive
Sacramento, CA 95825

Advanced Technological Education
DUE-9553717
FY1995 $ 50,000
Computer and Information Technology

Title: Interactive, Conceptually Based Multimedia Instruction for Introductory Mechanics

Mark M. Bunge
San Jose City College
2100 Moorpark Avenue
San Jose, CA 95128-2723

Course and Curriculum Development
DUE-9455585
FY1995 $157,690
Physics

Title: Enhanced MBL and Implementation of Workshop Physics

Colin Terry
Ventura City Community College District
71 Day Road
Ventura, CA 93003-2037

Instrumentation & Laboratory Improvement
DUE-9550841
FY1995 $34,021
Physics

Title: Enhancement of the Community College Organic Chemistry Curriculum with FT-IR

Raymond H. Fong
City College of San Francisco
San Francisco, CA 94112-1821

Instrumentation & Laboratory Improvement
DUE-9551254
FY1995 $9,361
Chemistry

Title: Incorporation of Fourier Transform NMR into the Community College Organic Chemistry Curriculum

Robert T. Price
City College of San Francisco
San Francisco, CA 94112-1821

Instrumentation & Laboratory Improvement
DUE-9551330
FY1995 $44,083
Chemistry

Title: Discovering Mathematics with In-Class Computers

Robert Hasson
College of San Mateo
1700 West Hillsdale Boulevard
San Mateo, CA 94402-3757

Instrumentation & Laboratory Improvement
DUE-9551337
FY1995 $40,000
Mathematics

Title: Implementation of Biotechnology in Majors Biology

Martin Ikkanda
Los Angeles Pierce College
6201 Winnetka Avenue
Woodland Hills, CA 91371-0001

Instrumentation & Laboratory Improvement
DUE-9551346
FY1995 $12,686
Life Sciences

Title: Improvement of Undergraduate Education in Advanced CNC and CAD/CAM

Joan Stepsis
San Diego City College
3375 Camino Del Rio South
San Diego, CA 92108-3807

Instrumentation & Laboratory Improvement
DUE-9551480
FY1995 $27,485
Engineering Technology

Title: Human Physiology Laboratory Improved Through Cooperative Learning

Douglas Scott
Cabrillo College
6500 Soquel Drive
Aptos, CA 95003-3119

Instrumentation & Laboratory Improvement
DUE-9551905
FY1995 $43,283
Life Sciences

Title: Computer Enhanced Learning in Chemistry

Linda Zarzana
American River College
Los Rios Community College
Sacramento, CA 95825

Instrumentation & Laboratory Improvement
DUE-9551957
FY1995 $25,131
Chemistry

Title: Computerized Experiments in the Physiology and Biology Laboratory

Nancy Rauch
Peralta Community College District Office
333 East Eighth Street
Oakland, CA 94606-2844

Instrumentation & Laboratory Improvement
DUE-9552199
FY1995 $23,937
Life Sciences

Title: Biological Sciences Multimedia Laboratory

Sharon Daniel
Coast Community College District System Office
1370 Adams Avenue
Costa Mesa, CA 92626-5495

Instrumentation & Laboratory Improvement
DUE-9551656
FY1995 $42,000
Life Sciences

Title: Active Learning: Visualizing: Astronomy, Calculus, Computer Science, Earth Science, and Organic Chemistry with Multimedia Technology

Geoffrey Jones
El Camino College
16007 Crenshaw Boulevard
Torrance, CA 90506-0001

Instrumentation & Laboratory Improvement
DUE-9551864
FY1995 $80,000
Interdisciplinary

Title: Infusing Technology into the Biology Majors Program

Charles Hoyt
Southwestern College
Department of Biology
900 Otay Lakes Road
Chula Vista, CA 91910

Instrumentation & Laboratory Improvement
DUE-9552290
FY1995 $38,570
Biotechnology

Title: The Golden West College Multimedia Classroom-Laboratory

John Wadhams
Golden West College
15744 Golden West
Huntington Beach, CA 92647

Instrumentation & Laboratory Improvement
DUE-9552379
FY1995 $35,204
Mathematics

Title: Oceanography Short Course for Instructors of Undergraduate Marine Science

Shannon O'Dunn
Grossmont College
8800 Grossmont College Dr
El Cajon, CA 92020-1765

Undergraduate Faculty Enhancement
DUE-9455073
FY1995 $126,683
Geology

Title: Chemistry and Physics Fundamentals for Middle School Minority Teachers or Teachers of Minority Students

Susan L. Arena
Mount San Antonio College
Walnut, CA 91789-1341

Teacher Enhancement Program
ESI-9355559
FY1995 $446,015

Title: Multi-Campus NSFNET Connection Through BARRNet

Frank Vaskelis
College of San Mateo
1700 West Hillsdale Boulevard
San Mateo, CA 94402-3757

Network Infrastructure
NCR-9409303
FY1995 $45,290
Computer Sciences

Title: Making Good the Promise: A Regional Infrastructure Model for Science Education by Way of Electronic Field Trips from Abyss to Andromeda

David Warren
Cabrillo College
6500 Soquel Drive
Aptos, CA 95003-3119

Network Infrastructure
REC-9554325
FY1995 $499,438 ($999,543)
Interdisciplinary

COLORADO

Title: Electronics Technology Curriculum Development

Brenda L. Bryan
Front Range Community College
3645 West 112th Avenue
Westminster, CO 80030

Advanced Technological Education
DUE-9553685
FY1995 $ 301,783
Electronics

Title: Rocky Mountain Advanced Technology Education Project
Don E. Goodwin
Colorado Community College System
9125 East 10th Drive, Building 859
Aurora, CO 80010

Advanced Technological Education
DUE-9553706
FY1995 $181,170 ($298,464)
Manufacturing

Title: On the Wing: Studies in Field Ornithology
Christine Chopyak-Minor
Keystone Center for Continuing Education
Dillon, CO 80435-0606

Young Scholars Program
ESI-9452735
FY1995 $43,200 ($86,400)

Title: New Connections from AIMSNet to the Internet
Norman Hall
Aims Community College
BOX 69
Greeley, CO 80632-0069

Network Infrastructure
NCR-9521815
FY1995 $25,324
Computer Sciences

DELAWARE

Title: Delaware State University Summer Science Camp
Mildred Ofosu
Delaware Technical Community College Terry Campus
1832 North Dupont Parkway
Dover, DE 19901-2221

Summer Science Camps
HRD-9550751
FY1995 $63,838
Interdisciplinary

FLORIDA

Title: Introductory College Physics 2000 - ICP/2
Alexander K. Dickison
Seminole Community College
Highway 1792
Sanford, FL 32771

Advanced Technological Education
DUE-9553665
FY1995 $429,521
Physics

Title: Computer Interface Physiology Equipment
Michael Vitale
Daytona Beach Community College
1200 Volusia Avenue
Daytona Beach, FL 32114-2817

Instrumentation & Laboratory Improvement
DUE-9551862
FY1995 $17,755
Life Sciences

Title: Improvement of Science Instruction Through Use of a Scanning Electron Microscope
Ellen Cover
Manatee Community College
5840 26th Street West
Bradenton, FL 34207-3522

Instrumentation & Laboratory Improvement
DUE-9552111
FY1995 $47,250
Life Sciences

Title: Enhancing Physical Science Curricula Through Computer-Assisted Instruction and Data Image Processing
Gustavo Morales
Valencia Community College
P.O. Box 3028
Orlando, FL 32802-3028

Instrumentation & Laboratory Improvement
DUE-9552234
FY1995 $20,327
Interdisciplinary

Title: Undergraduate Curriculum in the 21st Century

Jeffrey B. Elsberry
Edison Community College
8099 College Parkway, SW
PO Box 6
Fort Myers, FL 33919-5566

Special Project
DUE-9554446
FY1995 $43,800

Title: Connection of Indian River Community College Campus-Wide Network to NSFNET Via SURANET

Paul O'Brien
Indian River Community College
3209 Virginia Avenue
Fort Pierce, FL 34981-5541

Network Infrastructure
NCR-9503413
FY1995 $25,000
Computer Sciences

Title: Connection to NSFNET

Kelly Hallas
Edison Community College
8099 College Parkway S.W.
Fort Myers, FL 33919-5566

Network Infrastructure
NCR-9521946
FY1995 $25,307
Computer Sciences

Title: Manatee Community College Connection to the Internet

Anthony Palmer
Manatee Community College
5840 26th Street West
Bradenton, FL 34207-3522

Network Infrastructure
NCR-9521955
FY1995 $24,550
Computer Sciences

Title: Santa Fe Community College Summer Science and Mathematics Camp (SSMC)

Curtis Jefferson
Santa Fe Community College
3000 N.W. 83rd Street
Gainesville, FL 32606-6210

Summer Science Camps
HRD-9553326
FY1995 $63,532
Interdisciplinary

GEORGIA

Title: Using Multimedia Technology to Enhance Electronics Engineering Technology Programs

Dorothy J. Harnish
University of Georgia
104 Industrial Arts Building
Athens, GA 30602

Advanced Technological Education
DUE-9553676
FY1995 $97,975
Engineering Technology

Title: Abraham Baldwin Agricultural College Physics Improvement Project

James Weeks
Abraham Baldwin Agricultural College
Station Box 1
Tifton, GA 31793

Instrumentation & Laboratory Improvement
DUE-9551600
FY1995 $29,671
Physics

Title: Science and Mathematics are Right Together (SMART)

John J. Morrell
Atlanta Metropolitan College
Atlanta , GA 30310-4448

Young Scholars Program
ESI-9353886
FY1995 $52,336 ($98,469)

ILLINOIS

Title: Development and Field Test of a Supplementary Welding Lab on Disk for Teachers and Students

Xueshu Song
Northern Illinois University
203 Still Hall
DeKalb, IL 60115

Advanced Technological Education
DUE-9553687
FY1995 $213,851
Manufacturing

Title: Ethics and Biotechnology: A Blueprint for the Future

Catherine Propst
Northwestern University
Center for Biotechnology
2153 Sheridan Road, Hogan 1-195
Evanston, IL 60208

Advanced Technological Education
DUE-9554445
FY1995 $69,980
Biotechnology

Title: Enhancing Physics Laboratory Practices in Rural Areas

Ray Culver
Illinois East Community College Olney Center
305 North West Street
Olney, IL 62450-1043

Instrumentation & Laboratory Improvement
DUE-9551803
FY1995 $9,626
Physics

Title: An Open, Interactive Laboratory for Rural College Students

John Stencel
Illinios East Community College Olney Center
305 North West Street
Olney, IL 62450-1043

Instrumentation & Laboratory Improvement
DUE-9552016
FY1995 $19,663
Life Sciences

Title: Biotechnology Instrumentation and Laboratory Improvement: Purchase of an HPLC System for Biotechnology

James Tulloss
City Colleges of Chicago Truman College
1145 Wilson Avenue
Chicago, IL 60640-5616

Instrumentation & Laboratory Improvement
DUE-9552375
FY1995 $22,000
Life Sciences

Title: Creating Effective Meterology Laboratory Modules to Improve Curriculum and Enhance Student Transition into Upper-Division Coursework

Paul Sirvatka
College of Du Page
22nd Street and Lambert Rd
Glen Ellyn, IL 60137

Leadership in Laboratory Development
DUE-9551536
FY1995 $305,000
Atmospheric Sciences

INDIANA

Title: Advancing Geo-Technology Education: Providing GIS Remote Skills for the Workforce of the Twenty-First Century

William A. Dando
Indiana State University
217 North 6th Street
Terre Haute, IN 47809

Advanced Technological Education
DUE-9553694
FY1995 $300,000
Geographical Information Systems

Title: Interdisciplinary Courses in Electronics Manufacturing
Elaine M. Cooney
Indiana University - Bloomington
799 West Michigan Street
Bloomington, IN 47402

Advanced Technological Education
DUE-9553699
FY1995 $297,475
Electronics

Title: Problem-Based Learning: A Key to Enhanced Performance in Advanced Technological Education
Buck F. Brown
Rose-Hulman Institute of Technology
5500 Wabash Avenue
Terre Haute, IN 47803

Advanced Technological Education
DUE-9553705
FY1995 $475,000
Engineering Technology

Title: New Laboratory Experiments in Analog Electronics Course Using Microcomputer Based Instrumentation and LabVIEW
Rajappa Papannareddy
Purdue University North Central
101 South US 421
Westville, IN 46391

Instrumentation and Laboratory Improvement
DUE-9550836
FY1995 $26,090
Electronics

IOWA

Title: National Forum on Critical Issues in Environmental Technology Programs at Two-Year Colleges
Ellen Kabat
Eastern Iowa Community College District
500 Belmont Road
Bettendorf, IA 52722

Advanced Technological Education
DUE-9453181
FY1995 $83,202
Environmental Technology

Title: ATEEC - Advanced Technological Environmental Education Center
Ellen Kabat
Eastern Iowa Community College District
500 Belmont Road
Bettendorf, IA 52722

Advanced Technological Education
DUE-9454638
FY1995 $999,961 ($2,999,866)
Environmental Technology

Title: Development of a Two-Year Associate Degree in Agricultural Technology
Terry Brase
Hawkeye Community College
1501 East Orange Road
Waterloo, IA 50704

Advanced Technological Education
DUE-9553751
FY1995 $ 200,000
Biotechnology

Title: A Modular Interactive Text for Linear Algebra
Eugene A. Herman
Grinnell College
Grinnell, IA 50112-0805
CoPI: Michael Pepe: Seattle Central Community College

Course & Curriculum Development
DUE-9455618
FY1995 $199,914
Mathematics

Title: Modular Chemistry Laboratory for Community College Students
Mary J. Abraham
Western Iowa Technical Community College
Department of Chemistry
4647 Stone Avenue
P O Box 265
Sioux City, IA 51102

Instrumentation and Laboratory Improvement
DUE-9551243
FY1995 $16,659
Chemistry

KANSAS

Title: A National Two-Year Associate Degree Program in Environmental Technology

Stephen E. Swanson
Kansas State University - Salina
2409 Scanlan Avenue
Salina, KS 67401

Advanced Technological Education
DUE-9553753
FY1995-$75,000
Environmental Technology

MAINE

Title: Computer Cartography and Geographic Information Systems Laboratory

Cathleen McAnneny
University of Maine Farmington
86 Main Street
Farmington, ME 04938-1911

Instrumentation & Laboratory Improvement
DUE-9551100
FY1995 $18,940
Geography

MARYLAND

Title: The Two-Year College in the Twenty-First Century: Breaking Down Barriers

Mary Beth Monroe
American Association of Physics Teachers
5110 Roanoke Place, Suite 101
College Park, MD 20740

Advanced Technological Education
DUE-9450160
FY1995 $208,348 ($1,185,405)
Physics

Title: Physics Education in the Two-Year Colleges: A Neglected Resource

Michael Neuchatz
American Institute of Physics
Education and Employment Statistic Division
One Physics Ellipse
College Park, MD 20740

Advanced Technological Education
DUE-9453180
FY1995 $99,988 ($385,680)
Physics

Title: Integrating Computer Software into Lower Division Engineering Technology Courses

William D. Lauffer
Prince George's Community College
301 Largo Road
Largo, MD 20772

Advanced Technological Education
DUE-9455105
FY1995 $39,269
Engineering Technology

Title: Remote Sensing, Image Processing, and Geographic Information Systems

Patricia A. Cunniff
Prince George's Community College
301 Largo Road
Largo, MD 20772

Advanced Technological Education
DUE-9553662
FY1995 $ 313,973 ($694,941)
Geographical Information Systems

Title: Associate Degree for Manufacturing Technicians

Arnold H. Packer
Johns Hopkins University
Charles and 34th Street
Baltimore, MD 21218

Advanced Technological Education
DUE-9553664
FY1995 $ 499,967 ($1,299,834)
Manufacturing

Title: Classroom Computer Laboratory and Student Demonstration Stations for Active Learning in Introductory Mathematics and Computer Science Courses

Sylvia Sorkin
Essex Community College
7201 Roseville Boulevard
Essex, MD 21237-3855

Instrumentation & Laboratory Improvement
DUE-9552321
FY1995 $56,886
Mathematics

Title: Maryland Undergraduate Mathematics Enhancement Program II

Jon W. Scott
Montgomery College Takoma Park
Takoma Park, MD 20912-1101

Undergraduate and Faculty Enhancement
DUE-9554632
FY1995 $98,505
Mathematics

Title: Young Scholars

Patricia A. Cunniff
Prince George's Community College
Largo, MD 20772-2199

Young Scholars Program
ESI-9353887
FY1995 $47,866 ($95,549)

Title: The Young Scholars Field Research Institute

Janet McMillen
Prince George's Community College
301 Largo Road
Largo, MD 20772-2199

Young Scholars Program
ESI-9553500
FY1995 $46,007

Title: Connections to NSFNET

Fred Schram
Anne Arundel Community College
101 College Parkway
Arnold, MD 21012-1857

Network Infrastructure
NCR-9417263
FY1995 $24,376
Computer Sciences

MASSACHUSETTS

Title: REU-Site for Biotechnology

Bruce Jackson
Massachusetts Bay Community College
50 Oakland Street
Wellesley, MA 02181-5359

Research Experiences for Undergraduate Sites
BIR-9424103
FY1995 $55,796 ($176,388)
Life Sciences

Title: Advanced Biotechnology Education Project

Barry L. Werner
Middlesex Community College
Springs Road
Bedford, MA 01730

Advanced Technological Education
DUE-9454642
FY1995 $392,307 ($1,132,394)
Biotechnology

Title: Mathematics for Technology - Laboratory Investigations

Gary M. Simundza
Wentworth Institute of Technology
550 Huntington Avenue
Boston, MA 02115

Advanced Technological Education
DUE-9455996
Planning Grant
FY1995-$46,804
DUE-9553704
Implementation Award
FY1995 $ 499,951
Mathematics

Title: Teacher/Faculty Enhancement, Curriculum Development and Laboratory Improvement for Fiber Optics Technology Education

Nicholas M. Massa
New England Board of Higher Education
45 Temple Place
Wellesley, MA 02180

Advanced Technological Education
DUE-9553762
FY1995 $365,100
Electronics

Title: Bunker Hill Community College Computer Network Program: Upgrading Microcomputer Technician Skills with a Dedicated Novell Lab

Judith C. Oleks
Bunker Hill Community College
Department of Computer Technology
250 New Rutherford Avenue, RM D206E
Boston, MA 02129

Instrumentation and Laboratory Improvement
DUE-9551649
FY1995 $33,175
Computer Technology

Title: Connection to NSFNET

Kevin College
Lasell Junior College
1844 Commonwealth Ave
Newton, MA 02166-2709

Network Infrastructure
NCR-9508267
FY1995 $24,000
Computer Sciences

MICHIGAN

Title: Chemical Engineering Technology Advanced Process Operations Program

Edward R. Fisher
Michigan Technological University
Department of Chemical Engineering
1400 Townsend Drive
Houghton, MI 49931

Advanced Technological Education
DUE-9553671
FY1995 $499,996
Chemical Technology

Title: The Southeastern Michigan Alliance for Reinvestment in Technological Education (SMARTE) Project

Mulchand S. Rathod
Wayne State University
Department of Engineering Technology
Detroit, MI 48202

Advanced Technological Education
DUE-9553692
FY1995 $ 149,900
Manufacturing

Title: Building Conceptual Frameworks with Synchronized Multiple Visualizations

Joel W. Russell
Department of Chemistry
Oakland University
Rochester, MI 48309-4401
CoPI: David Becker: Oakland Community College
CoPI: Tamar Y. Susskind: Oakland Community College

Course & Curriculum Development
DUE-9455747
FY1995 $91,593 ($153,877)
Chemistry

Title: Integrating Critical Thinking, Problem Solving and Quantitative Skills in the Lecture/Lab for Non-Traditional Black Students

Patricia Stewart
Highland Park Community College
Glendale at Third
Highland Park, MI 48203

Instrumentation & Laboratory Improvement
DUE-9551876
FY1995 $25,216
Life Sciences

Title: Enhancing Learning Using Computers To Improve Data Analysis In Biology Laboratory in A Predominantly Minority Community College

William Casey
Wayne County Community College
801 Fort Avenue
Detroit, MI 48226-3010

Instrumentation & Laboratory Improvement
DUE-9552355
FY1995 $14,000
Life Sciences

Title: A Fundamental Component of Engineering Technology

Gerald M. Garriot
Henry Ford Community College
5101 Evergreen Road
Dearborn, MI 48128

Instrumentation and Laboratory Improvement
DUE-9552360
FY1995 $64,089
Electronics

Title: NSFNET Connectivity for Washtenaw Community College

Richard Cooper
Washtenaw Community College
P O D-1
Ann Arbor, MI 48106-1610

Network Infrastructure
NCR-9402839
FY1995 $4,800
Computer Sciences

Title: NSFNET Connectivity

David Seith
Muskegon Community College
221 S. Quarterline Road
Muskegon, MI 49442

Network Infrastructure
NCR-9502991
FY1995 $25,788
Computer Sciences

Title: NSFNET Connection for Kirtland Community College

Michael Wahl
Kirtland Community College
BOX 59A
Roscommon, MI 48653-0059

Network Infrastructure
NCR-9412984
FY1995 $25,000
Computer Sciences

Title: NSF Connection for Macomb Community College

Joseph Sucher
Macomb County Community College
14500 Twelve Mile Road
Warren, MI 48093-3870

Network Infrastructure
NCR-9418074
FY1995 $25,000
Computer Sciences

Title: Internet Connectivity for Southwestern Michigan College

Jacqueline Bishop
Southwestern Michigan College
Cherry Grove Road
Dowagiac, MI 49047

NSFNET
NCR-9523651
FY1995 $24,782
Computer Sciences

MINNESOTA

Title: A Cooperative Learning Environment that Fosters the Pursuit of Scientific Careers for American Indians

Ted Wetherbee
Fond du Lac Tribal College
C/O Fond du Lac Reservation
Cloquet, MN 55720

Institutional Infrastructure
CDA-9417390
FY1995 $259,237 ($1,023,577)
Computer Sciences

Title: A Cooperative Learning Environment that Fosters the Pursuit of Scientific Careers for American Indians

Ted Wetherbee
Fond du Lac Tribal College
C/O Fond du Lac Reservation
Cloquet, MN 55720

Institutional Infrastructure
CDA-9541299
FY1995 $134,200
Computer Sciences

Title: A Program to Enhance Pre-Engineering Education via Interactive Television Collaboration and Microcomputer Based Instruction

Aaron Wenger
Arrowhead Community College
1121 4th Avenue SE
Grand Rapids, MN 55744-3956

Instrumentation & Laboratory Improvement
DUE-9551920
FY1995 $60,331
Engineering

MONTANA

Title: Planning Grant for Development of Systemic Undergraduate Chemistry Curriculum

John R. Amend
Montana State University
Bozeman, MT 59717
CoPI: Susan L. Arena, Mount San Antonio College

Course and Curriculum Development
DUE-9455826
FY1995 $49,248
Chemistry

Title: Networking Infrastructure for Native American Education - AIHEC Consortium

Luanne Belcourt
Stone Child College
Box 1082, Rocky Boy Route
Elder, MT 59521

Network Infrastructure
REC-9526134
FY1995 $1,149,550

NEBRASKA

Title: A Chemical Technology Curriculum and Materials Development Project

John V. Kenkel
Southeast Community College
8800 O Street
Lincoln, NE 68520

Advanced Technological Education
DUE-9553674
FY1995 $191,590
Chemical Technology

NEVADA

Title: Instrumentation to Apply the Scientific Method in Undergraduate Environmental Science Laboratories

James A. Collier
Truckee Meadows Community College
7000 Dandini Boulevard
Reno, NV 89512

Instrumentation and Laboratory Improvement
DUE-9550931
FY1995 $20,893
Environmental Technology

NEW HAMPSHIRE

Title: Defining the Emerging Role of the Technologist in a Computer-Aided- Engineering Environment

Robert W. Simoneau
Keene State College
229 Main Street
Keene, NH 03435

Advanced Technological Education
DUE-9553767
FY1995 $250,000 ($548,260)
Manufacturing

NEW JERSEY

Title: New Jersey Center for Advanced Technological Education

John Bakum
Middlesex County College
155 Mill Road
Edison, NJ 08818

Advanced Technological Education
DUE-9553749
FY1995 $985,997 ($2,966,470)
Engineering Technology

Title: Automated/Instrumentated Open Channel Hydraulics Laboratory

Marshall R. Boggio
Ocean County College
Department of Engineering
College Drive, P.O. Box 2001
Toms River, NJ 08753

Instrumentation and Laboratory Improvement
DUE-9551137
FY1995 $38,500
Civil Engineering Technology

Title: Metallographic Equipment for Manufacturing Processes and Materials Laboratory

Frank J. Rubino
Middlesex County College
Department of Mechanical/Civil Engineering
155 Mill Road
Edison, NJ 08818

Instrumentation and Laboratory Improvement
DUE-9552389
FY1995 $20,080
Manufacturing

NEW MEXICO

Title: The Bigger Picture: A Project-Based Course on Environmental Geophysics and Geochemistry

Steven Semken
Navajo Community College
PO Box 580
Shiprock, NM 87420-0580

Course & Curriculum Development
DUE-9554973
FY1995 $75,908
Geology

Title: Expansion of Undergraduate Biological Research Opportunities Through Acquisition of Laboratory Technology

Helen M. Foster
Santa Fe Community College
Santa Fe, NM 87502-4187

Instrumentation & Laboratory Improvement
DUE-95523367
FY1995 $7,544
Biology

Title: Summer Youth Math/Science Explanation (SYMSE)

John Pantano
Santa Fe Community College
Santa Fe, NM 87502-4187

Young Scholars Program
ESI-9452745
FY1995 $34,627 ($61,545)

NEW YORK

Title: Technology Instruction for the 21st Century
Bernard E. Mohr
CUNY Queensborough Community College
56th Avenue Springfield Boulevard
Bayside, NY 11364

Advanced Technological Education
DUE-9454613
FY1995 $205,300 ($512,965)
Electronics

Title: College/Industry Telecommunications Education Partnership
Charles W. Merideth
CUNY/NYC Technical College
300 Jay Street
Brooklyn, NY 11201

Advanced Technological Education
DUE-9553738
FY1995 $156,000
Engineering Technology

Title: Development and Implementation of Advanced Applied Technological Mathematics
Alfred Patrick
SUNY Adirondack Community College
Bay Road
Glens Falls, NY 12804

Advanced Technological Education
DUE-9553765
FY1995 $ 184,880 ($234,194)
Mathematics

Title: Portfolios to Integrate Mathematics, Science and Computer Science
Patricia Wilkinson
CUNY Borough of Manhattan Community College
199 Chambers Street
New York, NY 10007-1079

Course & Curriculum Development
DUE-9455559
FY1995 $294,797
Interdisciplinary

Title: Basics for Technicians: An Integrated Course of Study Encompassing Mathematics, Chemistry, and Physics
Judith Tavel
SUNY Dutchess Community College
Pendell Road
Poughkeepsie, NY 12601

Course & Curriculum Development
DUE-9540956
FY1995 $25,145 ($115,000)
Interdisciplinary

Title: State University of New York (SUNY) Pre-Precalculus Program: Empowering Underprepared Two- and Four-Year College Mathematics Students
Patricia A. Shuart
SUNY - Oswego
Oswego, NY 13126
CoPI: Arlene Kleinstein: SUNY Farmingdale
CoPI: Carol Poucher: SUNY Jamestown Community College
CoPI: Alfred J. Patrick: SUNY Adirondack Community College

Course & Curriculum Development
DUE-9455638
FY1995 $184,393
Mathematics

Title: Computer Statistics Laboratory
Patricia Wilkinson
CUNY Borough Manhattan Community College
199 Chambers Street
New York, NY 10007-1079

Instrumentation & Laboratory Improvement
DUE-9551275
FY1995 $29,391
Mathematics

Title: The Mathematics Center Computer Classroom Development Project at Queensborough Community College

Sylvia Svitak
CUNY Queensboro Community College
56th Ave Springfield Boulevard
New York, NY 11364

Instrumentation & Laboratory Improvement
DUE-9551562
FY1995 $35,000
Mathematics

Title: Developing a Micropropagation Training Laboratory

Charles Tarrants
SUNY Tech Delhi
Delhi, NY 13753-1190

Instrumentation & Laboratory Improvement
DUE-9551715
FY1995 $32,644
Life Sciences

Title: Integration of Workshop Approaches into the Teaching of Mathematics to a Diverse Student Population: A SUNY Faculty Coalition

Jack Y. Narayan
SUNY - Oswego
Syngg Hall #18
Oswego, NY 13126
CoPI: Carol Freeman: SUNY Community College of Finger Lakes
CoPI: John Winn: SUNY Farmingdale
CoPI: Anne Landrey: SUNY Dutchess Community College

Undergraduate Faculty Enhancement
DUE-9455113
FY1995 $93,915
Mathematics

Title: Animations, Portfolios and CD-ROM Technology in Science and Calculus

Patricia Wilkinson
CUNY Borough of Manhattan Community College
199 Chambers Street
New York, NY 10007-1079

Undergraduate Faculty Enhancement
DUE-9554672
FY1995 $100,000
Mathematics

Title: BMCC Project in Science, Technology and Society

Jonathan Lang
CUNY Borough of Manhattan Community College
New York, NY 10007

Science and Humanities: Integrating Undergraduate Education
EW-20307
FY1995 $120,00

NORTH CAROLINA

Title: New Technologies, Techniques and Technical Skills in the Manufacturing Economy: Reinventing Community Colleges

Stuart A. Rosenfeld
Regional Technology Strategies, Inc.
Chapel Hill, NC 27514

Advanced Technological Education
DUE-9553698
FY1995 $ 79,500
Manufacturing

Title: Collaborative Model for Technician Education Through Interactive Technology

J. Parker Chesson
North Carolina State Board of Community Colleges
200 West Jones Street
Raleigh, NC 27603

Advanced Technological Education
DUE-9553709
FY1995 $ 120,000
Manufacturing

Title: The Western Piedmont Community College Computer Enhanced Mathematics Instruction Project

Odell Witherspoon
Western Piedmont Community College
1001 Burkemont Avenue
Morganton, NC 28655-4504

Instrumentation & Laboratory Improvement
DUE-9551705
FY1995 $38,600
Mathematics

Title: Computer Supplementation in Biology Lab

Nina Williams
James Sprunt Community College
P O Box 398
Kenansville, NC 28349-0398

Instrumentation & Laboratory Improvement
DUE-9552110
FY1995 $15,211
Life Sciences

Title: Strain Gage Instrumentation for Analysis of Trusses and Other Mechanical Assemblies

Gregory Watkins
Central Piedmont Community College
P O BOX 35009
Charlotte, NC 28235-5009

Instrumentation & Laboratory Improvement
DUE-9552393
FY1995 $8,053
Engineering Technology

Title: National Science Foundation Young Scholars Program at Chowan College

Garth D. Faile
Chowan College
200 Jones Drive
Murfreesboro, NC 27855

Young Scholars Program
ESI-9353062
FY1995 $36,144 ($71,165)

Title: Roanoke River Valley Consortium Summer Science Camp

Charles Slemenda
Nash Community College
Old Carriage PO Box 7488
Rocky Mount, NC 27804-0488

Summer Science Camps
HRD-9550778
FY1995 $100,765
Interdisciplinary

NORTH DAKOTA

Title: Curriculum Enhancement Through Atomic Absorption Spectroscopy

Michael Burke
North Dakota State College of Science
800 North 6th Street
Wahpeton, ND 58075-3602

Instrumentation & Laboratory Improvement
DUE-9551808
FY1995 $35,655
Chemistry

Title: Mathematics for Indians Symmer Horizon Institute (MISHI)

Sunil Karnawat
Turtle Mountain Community College
P O Box 340
Belcourt, ND 58316-0340

Young Scholars Program
ESI-9352979
FY1995 $68,568 ($134,160)

Title: MPWG: Mathematics Enrichment Girls Academy (MEGA)

Sunil Karnawat
Turtle Mountain Community College
Box 340
Belcourt, ND 58316-0340

Activities for Women & Girls
HRD-9554495
FY1995 $90,303
Interdisciplinary

Title: High Plains Rural Systemic Initiative

W. Larry Belgarde
Turtle Mountain Community College
Box 340
Belcourt, ND 58316-0340

Rural Systemic Initiative
OSR-9554467
FY1995 $1,600,000 ($9,600,000)
Interdisciplinary

OHIO

Title: Partnership for the Advancement of Chemical Technology (PACT)

Arlyne M. Sarquis
Miami University Middletown
4200 East University Boulevard
Middletown, OH 45052

Advanced Technological Education
DUE-9454518
FY1995 $400,000 ($1,200,00)
Chemical Technology

Title: National Center of Excellence for Advanced Manufacturing Education (NCE/AME)

David T. Harrison
Sinclair Community College
444 West Third Street
Dayton, OH 45402

Advanced Technological Education
DUE-9454571
FY1995 $1,000,000 ($3,00,000)
Manufacturing

Title: A National Workshop to Develop a National Agenda for the Future of Engineering Education

George H. Sehi
Sinclair Community College
444 West Third Street
Dayton, OH 45402

Advanced Technological Education
DUE-9550659
FY1995 $ 111,319
Engineering Technology

Title: Advanced Technological Education Project in Environmental Technology

Jeffrey Cramer
Stark Technical College
6200 Frank Avenue, NW
Canton, OH 44720

Advanced Technological Education
DUE-9553768
FY1995 $516,209
Environmental Technology

Title: HVAC Research and Development Project

George Sehi
Sinclair Community College
444 West Third Street
Dayton, OH 45402-1421

Instrumentation & Laboratory Improvement
DUE-9544183
FY1995 $18,727
Materials Science

Title: Rapid Prototyping in Drafting and Design Technology

Steven Wendel
Sinclair Community College
444 West Third Street
Dayton, OH 45402-1421

Instrumentation & Laboratory Improvement
DUE-9550953
FY1995 $70,316
Engineering Technology

Title: Instrumentation Workshops for Two-Year College Chemistry Faculty

Richard Jones
Sinclair Community College
444 West Third Street
Dayton, OH 45402-1421

Undergraduate Faculty Enhancement
DUE-9455063
FY1995 $275,000
Chemistry

Title: Teaching Science With Toys: Cultivation Advancements in Physical Science (TOYS: CAPS)
Arlyne M Sarquis
Miami University Middletown
4200 East University Boulevard
Oxford, OH 45056

Teacher Enhancement Program
ESI-9355523
FY1995 $446,276 ($1,117,732)

Title: Connection of Lourdes College to OARnet and NSFNET
Bina Isaac
Lourdes College
6832 Convent Boulevard
Sylvania, OH 43560-2891

Network Infrastructure
NCR-9503794
FY1995 $14,950
Computer Sciences

Title: Connection to NSFNET
Lu-Hsin Klein
Stark Technical College
6200 Frank Avenue N W
Canton, OH 44720-7228

Network Infrastructure
NCR-9505456
FY1995 $13,011
Computer Sciences

OREGON

Title: Advanced Technological Education Programs in Semiconductor Manufacturing
David Hata
Portland Community College
Department of Microelectronics Technology
P O Box 19000
Portland, OR 97219

Advanced Technological Education
DUE-9454589
FY1995 $100,000 ($200,000)
Electronics

Title: Northwest Center for Sustainable Resources (A National Center for Advanced Technology)
Wynn W Cudmore
Chemeketa Community College
4000 Lancaster Drive, NE, P O Box 14007
Salem, OR 97309

Advanced Technological Education
DUE-9553760
FY1995 $999,663 ($2,998,443)
Environmental Technology

Title: Chemistry Curriculum Modification for Computer-Interfaced Laboratory
Gilbert Albelo
Mount Hood Community College
26000 S E Stark
Gresham, OR 97030-3300

Instrumentation & Laboratory Improvement
DUE-9552228
FY1995 $25,083
Chemistry

PENNSYLVANIA

Title: Acquisition of Bruker AC-80 NMR with MacSpect 3 MNMR System
John Tierney
Pennsylvania State University Delaware Campus
25 Yearsley Mill Road
Media, PA 19063-5522

Chemical Instrumentation
CHE-9512329
FY1995 $72,900
Chemistry

Title: A Partnership for Excellence in Engineering Technology Education
Wayne R Hager
Pennsylvania State University
School of Engineering Technology
245 Hammond Building
University Park, PA 16801

Advanced Technological Education
DUE-9454547
FY 1994 $ 282,000
FY1995 $ 376,000 ($658,000)
Manufacturing

Title: Updating Undergraduate Laboratories: The Acquisition of a Fourier-Transform Infrared Spectrometer

Thomas Russo
Pennsylvania State University Altoona Campus
Smith Building
Altoona, PA 16603

Instrumentation & Laboratory Improvement
DUE-9551157
FY1995 $10,080
Chemistry

Title: Instrumentation Laboratory for the Electro-Mechanical Engineering Technology Program

Shahriar Jahanian
Pennsylvania State University Altoona Campus
3000 Ivyside Park
Altoona, PA 16603

Instrumentation and Laboratory Improvement
DUE-9551289
FY1995 $36,893
Engineering

Title: Saint Vincent College/National Science Foundation Young Scholars Program

Andrew B. Turner
Saint Vincent College
Latrobe, PA 15650

Young Scholars Program
ESI-9352955
FY1995 $59,106 ($116,624)

Title: PREPnet Internet Expansion Project

James Shaulis
Community College Allegheny County College Office
800 Allegheny Ave
Pittsburgh, PA 15233-1804

Network Infrastructure
NCR-9411364
FY1995 $25,000
Computer Sciences

SOUTH CAROLINA

Title: Integrating New Visions in Environmental Sciences Technology (INVEST)

Catherine Almquist
Trident Technical College
Department of Physical Sciences
P.O. Box 10367
Charleston, SC 29411

Advanced Technological Education
DUE-9553696
FY1995 $250,647
Environmental Technology

Title: The South Carolina Advanced Technological Education (SC ATE) Exemplary Faculty Project

Lynn Mack
Piedmont Technical College
Department of Mathematics
Greenwood, SC 29648

Advanced Technological Education
DUE-9553740
FY1995 $ 486,930 ($1,456,606)
Engineering Technology

SOUTH DAKOTA

Title: Native American Mathematics and Science Education Leadership

Leland M. Bordeaux
Sinte Gleska College Center
Rosebud, SD 57570-0490

Teacher Enhancement Program
ESI-9353470
FY1995 $582,900 ($1,637,100)

Title: Woksape (Knowledge)

Gregory Gagnon
Oglala Lakota College
Box 490
Kyle, SD 57752-0490

Model Institute of Excellence Non-Research
HRD-9550533
FY1995 $2,350,000 ($11,327,374)
Interdisciplinary

TENNESSEE

Title: Community College Science Connection Conference
Alfred Wohlpart
Oak Ridge Associated Universities
Science/Engineering Education Division
Oak Ridge, TN 37831

Advanced Technological Education
DUE-9552954
FY1995 $40,000
Interdisciplinary

Title: Curriculum and Pedagogy Standards for Two-Year College and Lower Division Mathematics
Marilyn Mays
AMATYC
North Lake College
5001 North MacArthur Boulevard
Memphis, TN 38134

Course and Curriculum Development
DUE-9443721
FY1995 $ 34,300 ($125,010)
Mathematics

Title: Title: Mathematics Computer Laboratory
Judith Hector
Walters State Community College
500 South Davy Crockett Parkway
Morristown, TN 37813-6899

Instrumentation & Laboratory Improvement
DUE-9552262
FY1995 $48,148
Mathematics

Title: NSFNET Connection for the Overhill Ad hoc Consortium
Paul Barker
Hiwassee College
Madisonville, TN 37354

Network Infrastructure
NCR-9406826
FY1995 $70,150
Computer Sciences

TEXAS

Title: A Consortium for the Development of Advanced Manufacturing Education
Bartlett M. Sheinberg
Houston Community College
1550 Foxlake Drive, Suite 102A
Houston, TX 77270

Advanced Technological Education
DUE-9454569
FY1995 $ 305,000 (609,000)
Manufacturing

Title: Southwest Regional Center for Advanced Technological Education
Robert L. Musgrove
Texas State Technical Institute - Sweetwater
300 College Drive
Sweetwater, TX 79556

Advanced Technological Education
DUE-9454643
FY1995 $585,290 ($1,711,637)
Core and One or More Specific Technologies

Title: Advanced Technical Education (ATE) Alliance
James A. Jordan
Consortium for Advanced Manufacturing International (CAM-I)
1250 E. Copeland Road, Suite 500
Arlington, TX 76011

Advanced Technological Education
DUE-9454655
FY1995 $ 499,950 ($1,499,850)
Manufacturing

Title: Foundation Skills for Advanced Technology
Stephen B. Rodi
Austin Community College
1212 Rio Grande Street
Austin, TX 78701

Advanced Technological Education
DUE-9553689
FY1995 $ 318,715
Physics

Title: Regional Center of Excellence for Precision Manufacturing Technologies

Wayne Wells
Rio Grande Center for Manufacturing
Director's Office
1201 West University Drive
Edinburg, TX 78539

Advanced Technological Education
DUE-9553701
FY1995 $100,340
Manufacturing

Title: Machine Tool Advanced Skills Technology Educational Resources (MASTER) Program

John D Pierson
Texas State Technical Institute - Waco
3801 Campus Drive
Waco, TX 76705

Advanced Technological Education
DUE-9553716
FY1995 $ 550,000 ($1,550,00)
Manufacturing

Title: Digital Imaging Laboratory Development Program

Bobby Hoyle
Texas State Technical Institute - Harlingen
Department of Information Management Technology
2424 Boxwood
Harlingen, TX 78550

Advanced Technological Education
DUE-9553741
FY1995 $ 100,000
Engineering Technology

Title: Mathematical Interactive Network Design (MIND): A Computer Lab for Developmental Mathematics

Kathryn Wetzel
Amarillo College
P O BOX 447
Amarillo, TX 79178-0001

Course & Curriculum Development
DUE-9455606
FY1995 $75,394
Mathematics

Title: A Two-Year College Transforms Physiology Laboratory Exercises with Interactive Computer-Enhanced Instruction

Katherine A Hoffman
Tarrant CJC Northeast
828 Harwood Road
Hurst, TX 76054-3219

Instrumentation & Laboratory Improvement
DUE-9550878
FY1995 $27,348
Life Sciences

Title: Using Technology as a Catalyst for Learning in Developmental Mathematics

Margaret Crider
North Harris County College
233 Benmar, Ste. 150
Houston, TX 77060-2544

Instrumentation & Laboratory Improvement
DUE-9551373
FY1995 $25,245
Mathematics

Title: Enhancing Biology Instruction Through Computer Assisted Laboratory

David Smith
Alamo Community College San Antonio
1300 San Pedro Ave
San Antonio, TX 78207-3033

Instrumentation & Laboratory Improvement
DUE-9551548
FY1995 $68,913
Life Sciences

Title: Mathematical Interactive Network Design (MIND) a Computer Laboratory for Developmental Mathematics

Kathryn Wetzel
Amarillo College
P O BOX 447
Amarillo, TX 79178-0001

Instrumentation & Laboratory Improvement
DUE-9551581
FY1995 $32,602
Mathematics

Title: Laboratory Development for Microelectronics Technology
Jenna Ware
Texas State Institute Sweetwater
Route Three
Sweetwater, TX 79556-9803

Instrumentation & Laboratory Improvement
DUE-9552265
FY1995 $59,602
Engineering Technology

Title: Two-Year College Physics Faculty Enhancement Program
Robert B. Clark
Texas Engineering Exp Station
College Station, TX 77843-3577
CoPI: Tom O'Kuma: Lee College

Undergraduate Faculty Enhancement
DUE-9354017
FY1995 $134,432 ($268,864)
Physics

Title: Multimedia Instructional Design for Engineering Faculty
Kathryn Wetzel
Amarillo College
P O BOX 447
Amarillo, TX 79178-0001

Undergraduate Faculty Enhancement
DUE-9455142
FY1995 $43,926
Engineering

Title: South Central Calculus Coalition: Disseminating Calculus Reform for Two-Year Colleges and Comprehensive Universities
Gregory D. Foley
Sam Houston State University
Houston, TX 77341-2026
CoPI: Donald James: North Harris County College
CoPI: Shanon Sledge: San Jacinto College Central Campus
CoPI: Donald James: North Harris County College

Undergraduate Faculty Enhancement
DUE-9455163
FY1995 $192,922
Mathematics

Title: College of the Mainland Wide Area Instructional Network: Connections to NSFNET
Pete Doak
College of the Mainland
8001 Palmer Highway
Texas City, TX 77591-2447

Network Infrastructure
NCR-9421203
FY1995 $20,000
Computer Sciences

VIRGINIA

Title: High Quality Biotechnology Education
Kathleen Frame
National Association of Biology Teachers
11250 Roger Bacon Drive
Reston, VA 22090

Advanced Technological Education
DUE-9553720
FY1995 $499,239
Biotechnology

Title: Governor's School Strengthening Grant
William C. Allgyer
Mountain Empire Community College
Big Stone Gap, VA 24219-0700

Young Scholars Program
ESI-9353015
FY1995 $42,005 ($83,780)

WASHINGTON, DC

Title: Faculty Development and Dissemination for ATE Program
Lynn Barnett
American Association of Community Colleges
One Dupont Circle, NW, Suite 410
Washington, DC 22036

Advanced Technological Education
DUE-9540310
FY1995 $ 15,439
Special Project

Title: Science Technology: Knowledge and Skills
David K. Lavallee
American Chemical Society (ACS)
1155 16th Street, NW
Washington, DC 20036

Advanced Technological Education
DUE-9454564
FY1995 $ 500,000 ($1,500,000)
Chemical Technology

Title: Expanding the Network of Community Colleges in Advanced Science and Engineering Technology Education
James Mahoney
American Association of Community Colleges
One Dupont Circle, NW, Suite 410
Washington, DC 20036

Advanced Technological Education
DUE-9552975
FY1995 $237,320
Special Project

Title: Preparation of Technicians for the Biotechnology Industry
Jack G. Chirikjian
Georgetown University
3900 Reservoir Road, NW
Washington, DC 20007

Advanced Technological Education
DUE-9553661
FY1995 $250,000
Biotechnology

Title: Statistical Thinking and Teaching Techniques
George Cobb
Mathematical Association of America
Washington, DC 20036-1358
CoPI: Mary Parker: Austin Community College

Undergraduate Faculty Enhancement
DUE-9255447
FY1995 $99,836 ($450,068)
Mathematics

Title: Cooperative Learning in Undergraduate Mathematics Education: A Comprehensive Program for College Faculty
Edward L. Dubinsky
Mathematics Association of America
1529 18th Street NW
Washington, DC 20036-1358
CoPI: Janet Ray: Seattle Central Community College

Undergraduate Faculty Enhancement
DUE-9455164
FY1995 $99,806
Mathematics

WASHINGTON

Title: Advanced Technology Curriculum: Meeting AEA Standards
Andrew Woodson
North Seattle Community College
9600 College Way North
Seattle, WA 98103-3514

Advanced Technological Education
DUE-9553726
FY1995 $300,000 ($600,000)

Title: Northwest Center for Emerging Technologies: New Designs for Advanced Information Technology Education

Neil Evans
Bellevue Community College
3000 Landerholm Circle, SE
Bellevue, WA 98009
Seattle, WA 98103

Advanced Technological Education
DUE-9553727
FY1995 $999,737 ($2,992,054)
Computer and Information Technology
Electronics

Title: Course and Curriculum Development: Integrating Pre-Engineering Curriculum

Earl Hamilton
North Seattle Community College
9600 College Way North
Seattle, WA 98103-3514

Course & Curriculum Development
DUE-9455566
FY1995 $75,000
Engineering Technology

Title: The Geometry of Multivariable Calculus

Yves Nievergelt
Eastern Washington University
MS-32
Cheney, WA 99004-2415
CoPI: Rose Pugh: Bellevue Community College

Undergraduate Faculty Enhancement
DUE-9455061
FY1995 $149,712
Mathematics

WISCONSIN

Title: An Advanced Biotechnology Education Partnership Program

Joy A. McMillan
Madison Area Technical College
Department of Biotechnology
3550 Anderson Street
Madison, WI 53704

Advanced Technological Education
DUE-9454555
FY1995 $400,000 ($1,000,000)
Biotechnology

Title: Advanced Dimensional Metrology and ISO 9001 Educational Partnership Program

Robert L. Brown
Madison Area Technical College
Department of Engineering Technology
211 North Carroll Street
Madison, WI 53703

Advanced Technological Education
DUE-9553684
FY1995 $155,036
Manufacturing

Title: Molecular Biology and Computer Equipment for Revitalization of Bacteriology, Genetics Lab Grants

Terese M. Barta
University of Wisconsin Centers - Marathon
Madison, WI 53706-1490

Instrumentation & Laboratory Improvement
DUE-9550901
FY1995 $6,674
Biology

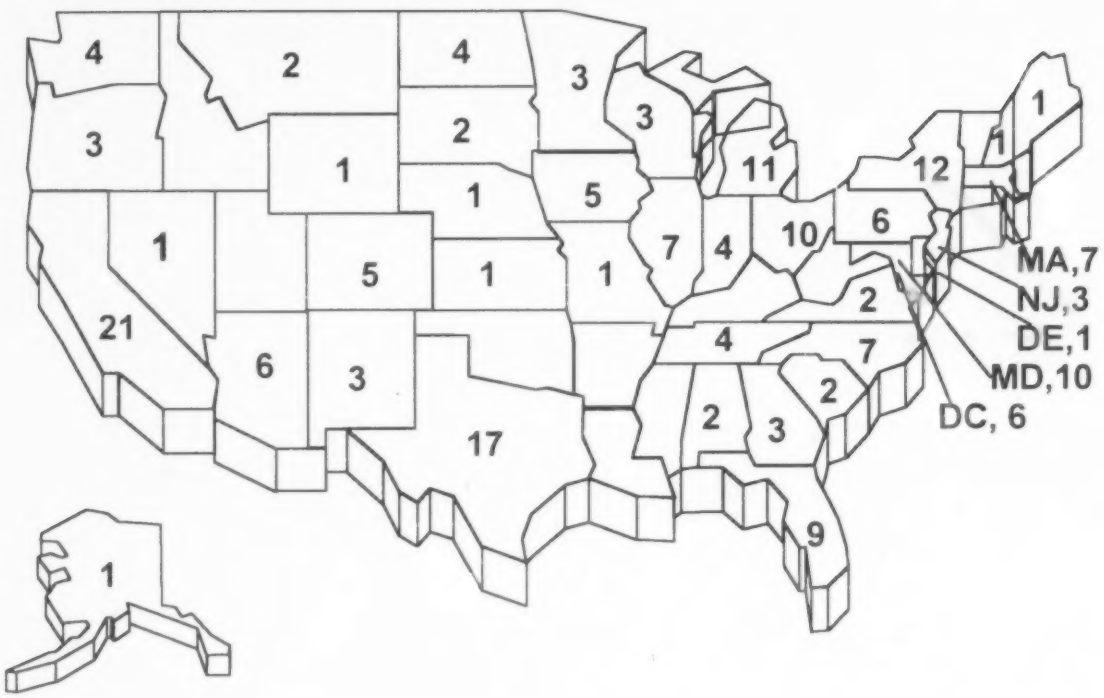
WYOMING

Title: Math Projects - Interdisciplinary Education Applications Through Industry Partnerships and Industry based Projects (MP-IDEA)

Peter Wildman
Casper College
Department of Mathematics
125 College Drive
Casper, WY 82601

Instrumentation and Laboratory Improvement
DUE-9552273
FY1995 $15,547
Mathematics

FY1995 Awards to Two-Year Colleges



This map includes the 189 Awards listed in Appendix II plus 2 IPA's (Missouri and Colorado) awards and one contract (Illinois) for a total of 192 awards as listed in Table I.

GETTING NSF INFORMATION AND PUBLICATIONS

The National Science Foundation (NSF) has several ways for the public to receive information and publications. Electronic or printed copies of the NSF telephone directory, abstracts of awards made since 1989, and many NSF publications are available as described below. To access information electronically, there is no cost to you except for possible phone and Internet access charges. Choose the method of access that matches your computer and network tools. For general information about Internet access and Internet tools, please contact your local computer support organization.

WORLD WIDE WEB: NSF HOME PAGE

The World Wide Web (WWW) system makes it possible to view text material as well as graphics, video, and sound. You will need special software (a "web browser") to access the NSF Home Page. The URL (Uniform Resource Locator) is ***http://www.nsf.gov/.***

INTERNET GOPHER

The Internet Gopher provides access to information on NSF's Science and Technology Information System (STIS) through a series of menus. To access the Gopher, you need Gopher client software; the NSF Gopher server is on port 70 of ***stis.nsf.gov***.

ANONYMOUS FTP (FILE TRANSFER PROGRAM)

Internet users who are familiar with FTP can easily transfer NSF documents to their local system for browsing and printing. The best way to access NSF information is to first look at the index (file name: **index.txt**). From the index, you can select the files you need. FTP instructions are:

- FTP to ***stis.nsf.gov***.
- Enter **anonymous** for the user name, and your e-mail address for the password.
- Retrieve the appropriate file (i.e., **filename.ext**).

E-MAIL (ELECTRONIC-MAIL)

To get documents via e-mail, send your request to the Internet address ***stisserve@nsf.gov***. The best way to find NSF information is to request the index. Your e-mail message should read: **get index.txt**. An index with file names will be sent to you. However if you know the file name of the document you want, your e-mail message should read: **get <filename.ext>**.

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NSF maintains several mailing lists to keep you automatically informed of new electronic publications. To get descriptions of the mail lists and instructions for subscribing, send your request to: ***stisserve@nsf.gov***. Your message should read: **get stisdirm.txt**.

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NSF's Science and Technology Information System (STIS) is an electronic publications dissemination system available via the Internet (telnet to ***stis.nsf.gov***); you will need a VT100 emulator. The system features a full-text search and retrieval software (TOPIC) to help you locate the documents. Login as **public** and follow the instructions on the screen.

To get an electronic copy of the "STIS USERS GUIDE," NSF 94-10, send an e-mail request to: ***stisserve@nsf.gov***. Your message should read: **get NSF9410.txt**. For a printed copy of the "STIS USERS GUIDE," see instructions "How To Request Printed NSF Publications."

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If you do not have an Internet connection, you can use remote login to access NSF publications on NSF's on-line system, STIS. You need a VT100 terminal emulator on your computer and a modem.

- Dial **703-306-0212**,
- choose 1200, 2400, or 9600 baud,
- use settings 7-E-1, and
- login as **public** and follow the on-screen instructions.

NSF 95-64 (Replaces NSF 94-4)

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You may request printed publications in the following ways:

- send e-mail request to: ***pubs@nsf.gov***
- fax request to: **703-644-4278**
- for phone request, call: **703-306-1130** or Telephonic Device for the Deaf (TDD **703-306-0090**)
- send written request to:

  NSF Forms and Publications Unit
  4201 Wilson Boulevard
  Room P-15
  Arlington, VA 22230

When making a request, please include the following information:

- NSF publication number;
- number of copies; and
- your complete mailing address.

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- visit the NSF Information Center, located on the second floor at 4201 Wilson Blvd., Arlington, Virginia.; or
- call the NSF Information Center at **703-306-1234**; or **703-306-0090** for TDD; or
- send e-mail message to ***info@nsf.gov***.

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